ISN 6094
RC.83.000.6094a

# MARQUETTE
## 1930 Models

# Specifications
*AND*
# Adjustments

Distributed by
McLAUGHLIN MOTOR CAR COMPANY, LIMITED
Subsidiary of General Motors of Canada, Limited
OSHAWA, ONTARIO

*June 1929*

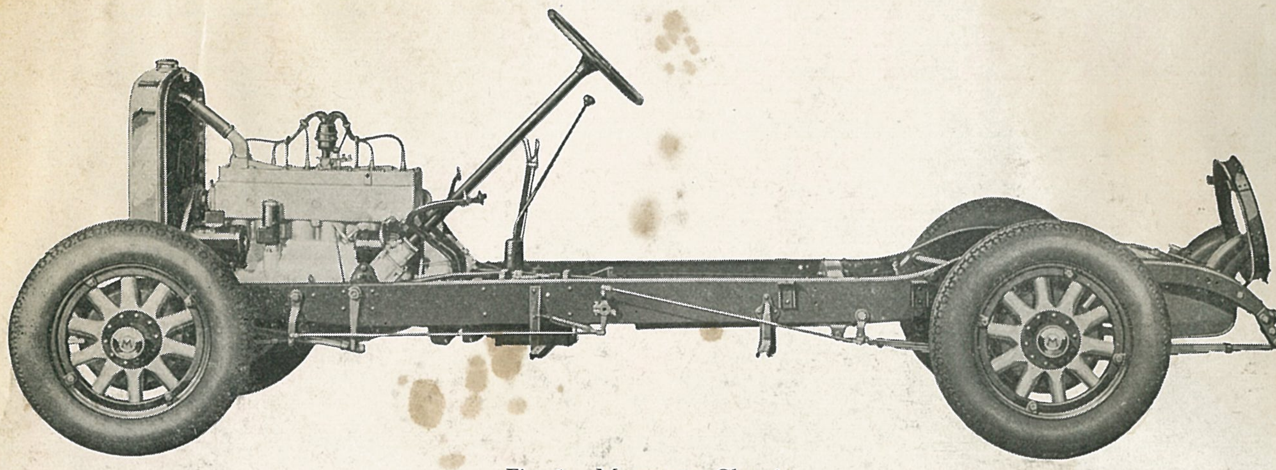


Fig. 1. Marquette Chassis

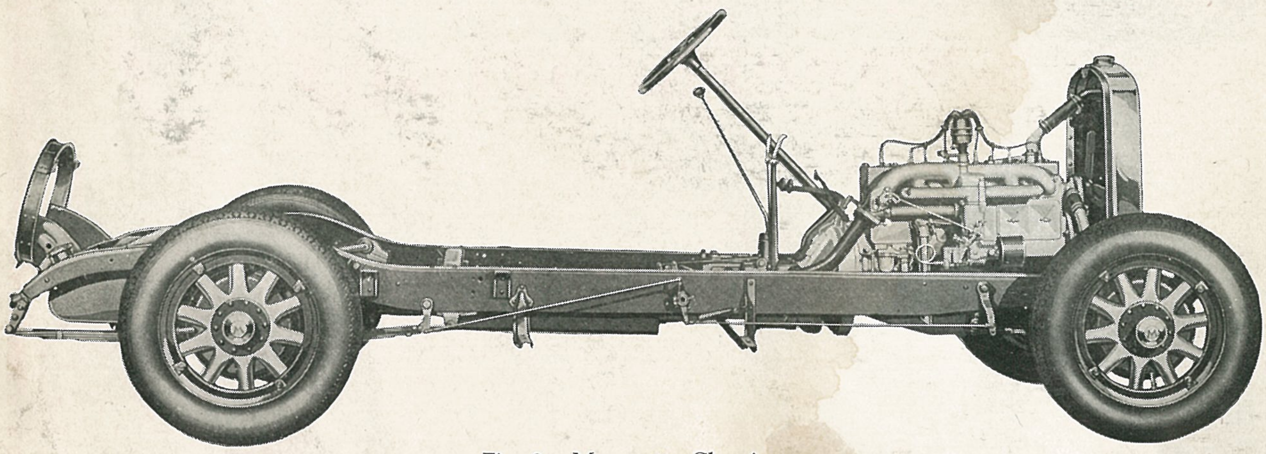


Fig. 2. Marquette Chassis

| | |
|---|---|
| Model | |
| 30 | Five-passenger two-door sedan |
| 34 | Four-passenger roadster |
| 35 | Five-passenger phaeton |
| 36 | Two-passenger coupe |
| 36-S | Four-passenger sport coupe |
| 37 | Five-passenger four-door sedan |
| Wheelbase | 114″ |
| Turning Circle | 38.6 ft. |
| Cylinder size | 3 ⅛″ x 4⅝″ |
| Displacement | 212.8 cu. in. |
| H. P. rating, actual | 67.5 |
| H. P. Rating, S. A. E. | 23.44 |
| Tires | 28 x 5.25 |
| Axle ratio | 4.54 to 1 |
| Fuel tank capacity | 13 gal. |

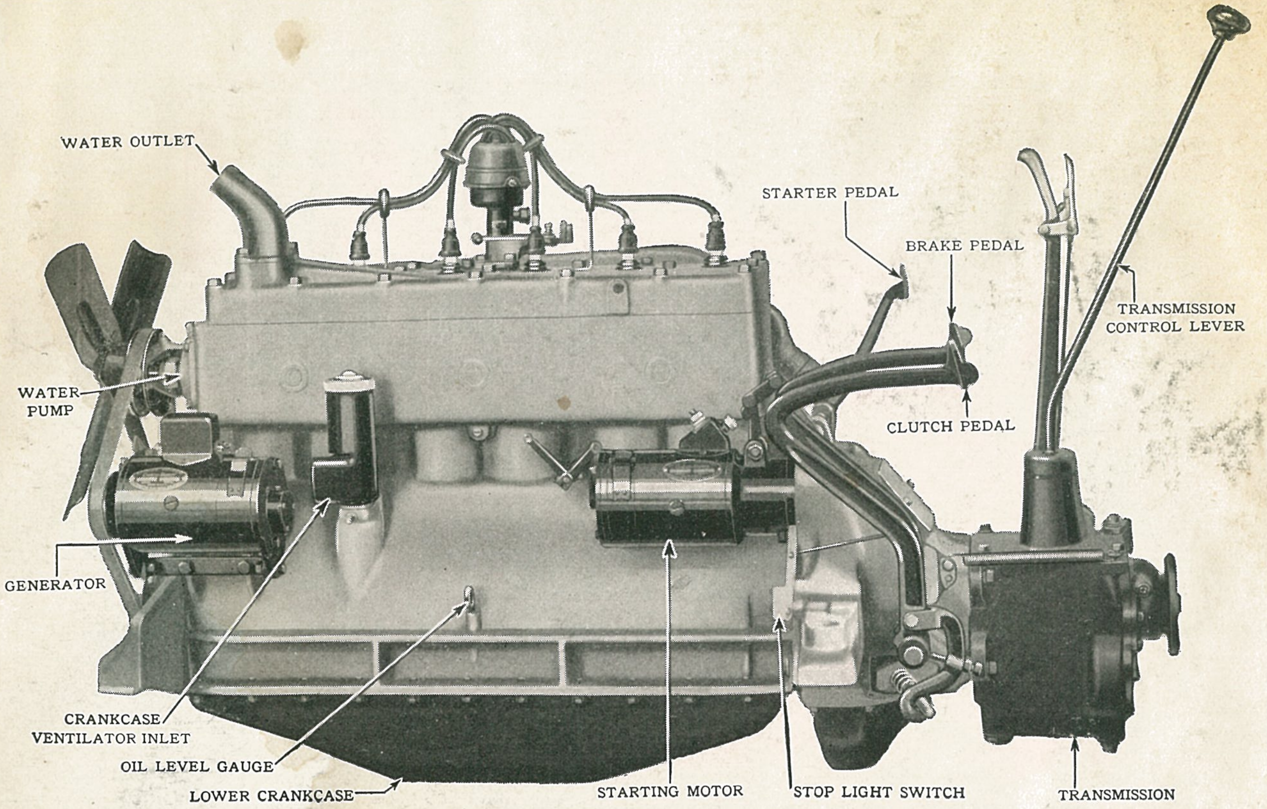



Fig. 3. Left Side View Engine

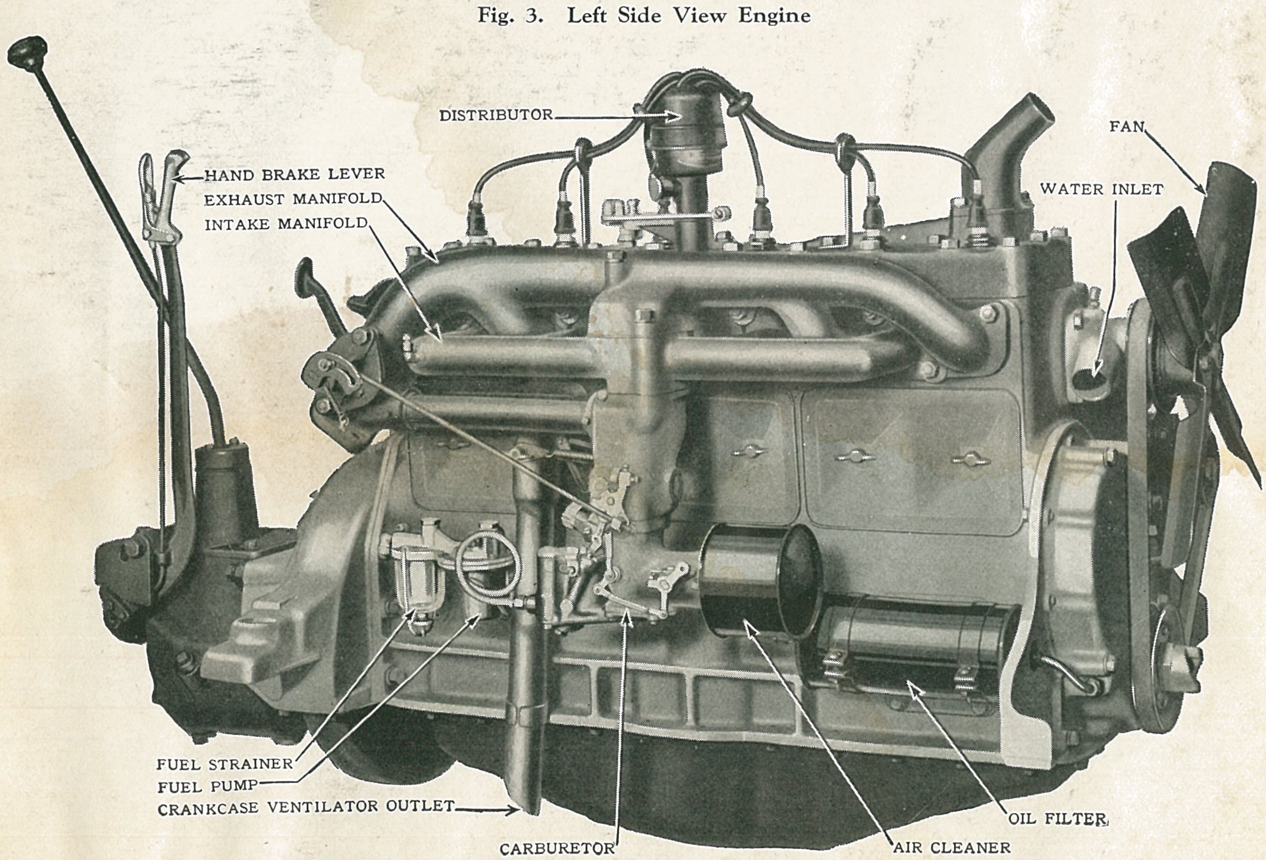



Fig. 4. Right Side View Engine

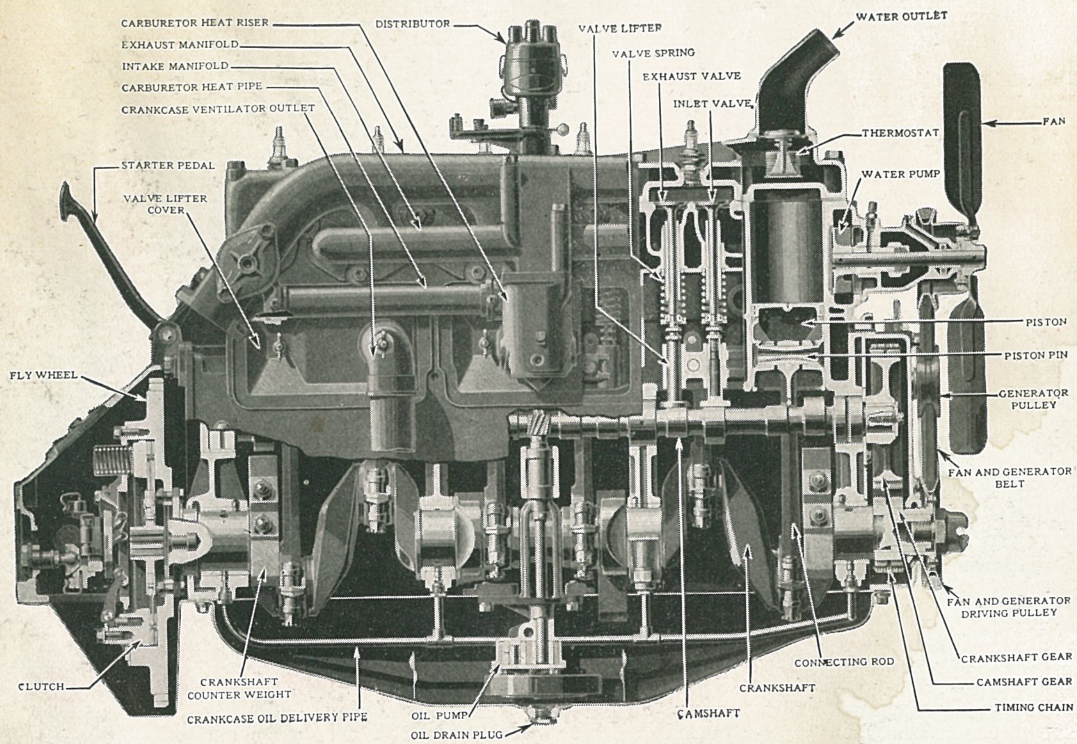



Fig. 5. Engine—Side Cut-a-Way View

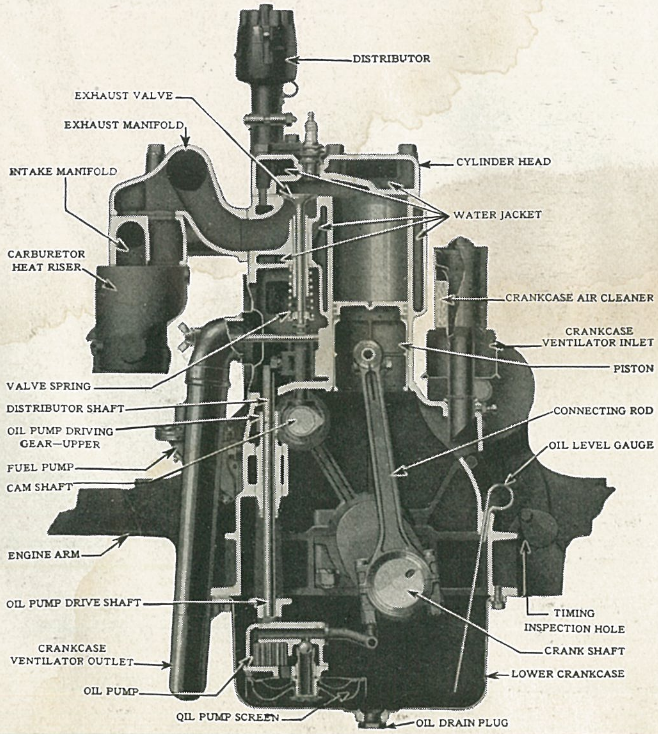



Fig. 6. Engine—End Cut-a-Way View

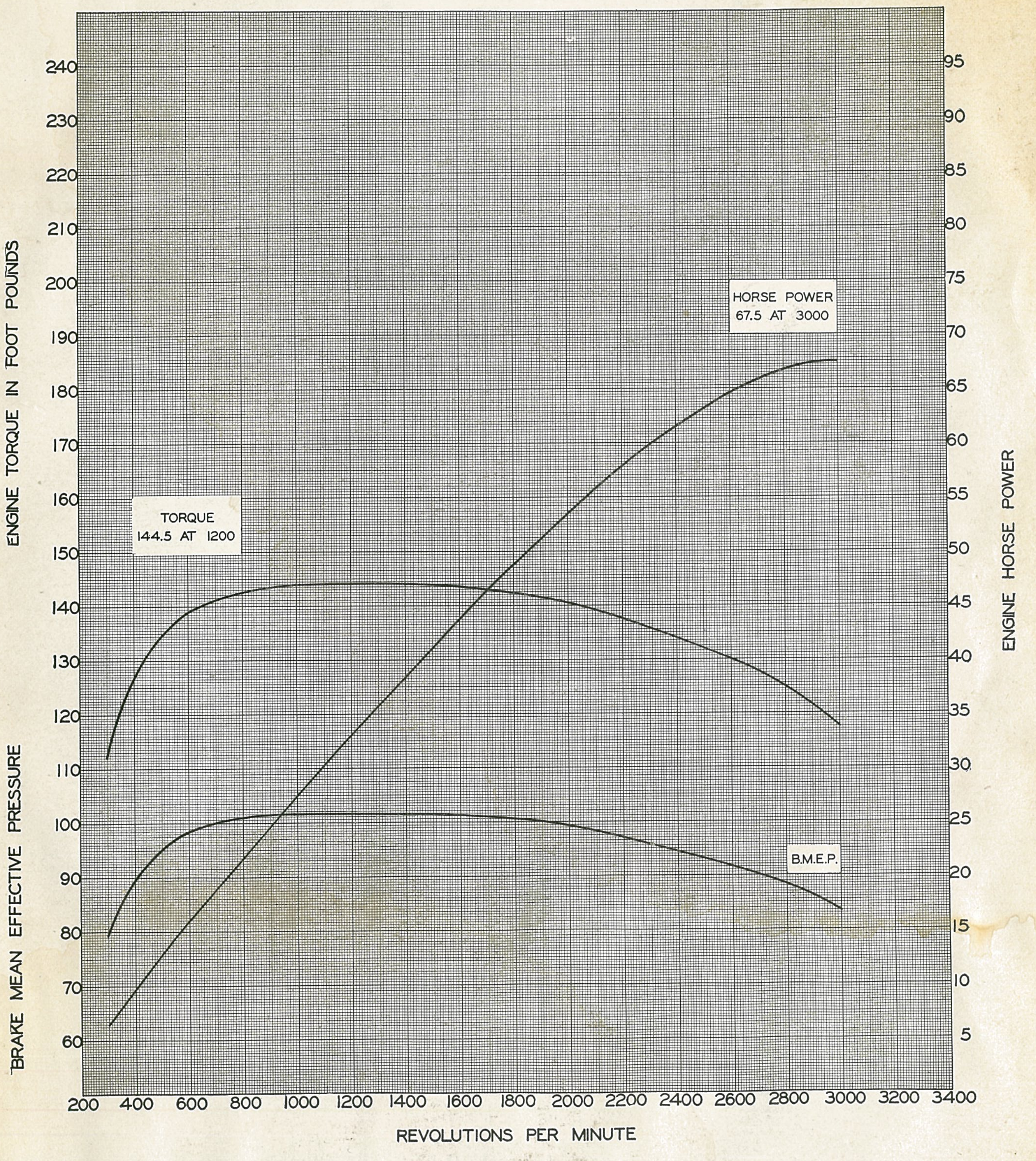
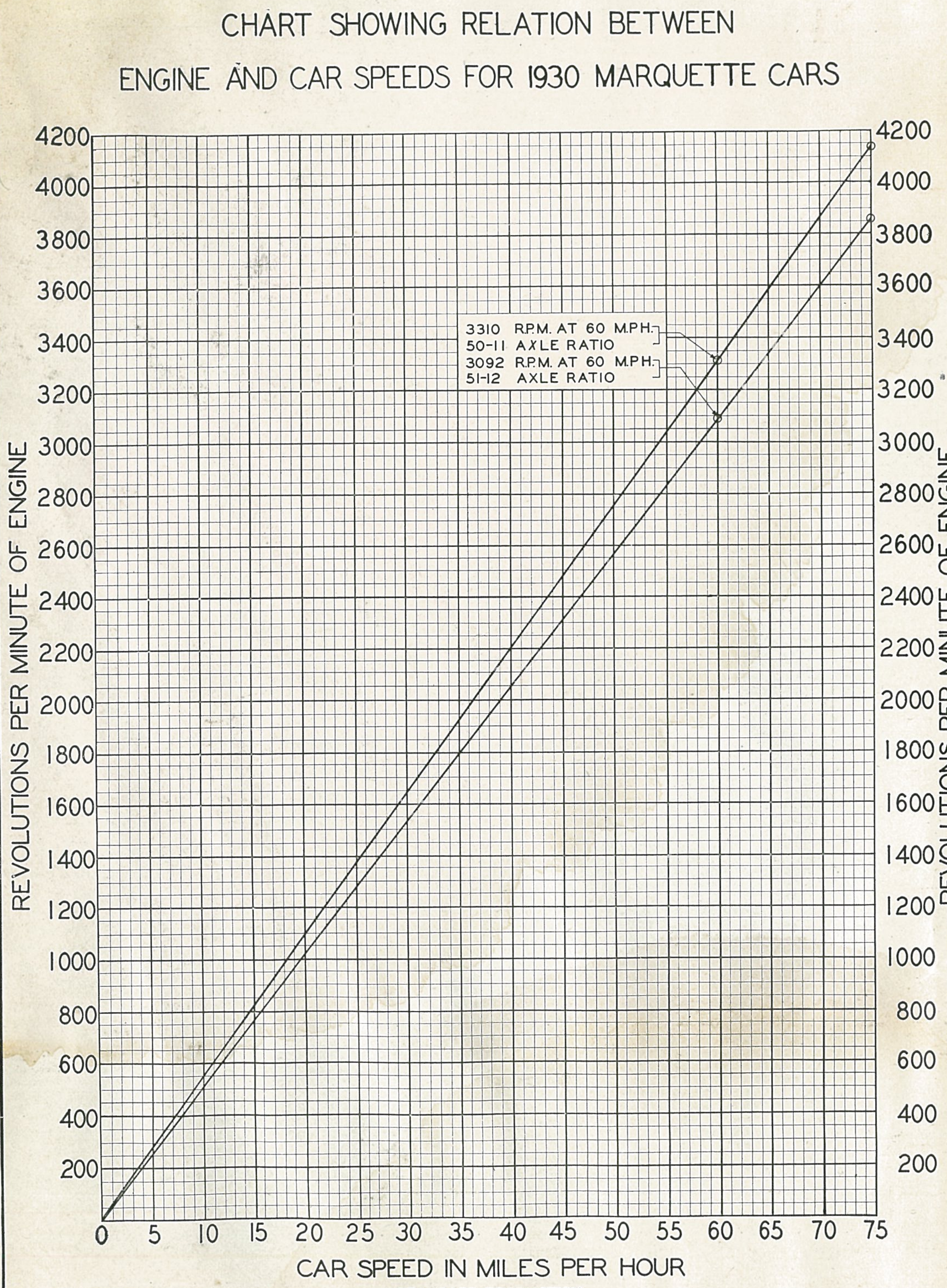



Fig. 7. Engine Horse Power, Torque and Mean Effective Pressure Curves.




STANDARD·PRODUCTION

ALL SERIES 30 - MODELS 30-34-35-36-36S · AND 37 USE 50-11 (4.54 TO 1) AXLE RATIO

TIRE SIZE 28 x 5.25 - REVOLUTIONS PER MILE 728

TIRE PRESSURE — 35 POUNDS

OPTIONAL GEAR RATIO WHEN USED IN CONNECTION WITH

HIGH COMPRESSION HEAD. MODELS 34-35-36-36S USE 51-12 (4.25 TO 1) AXLE RATIO

# Specifications and Adjustments

### Engine

Type . . . . . . . . . . . . . . . . L-head
Number of cylinders . . Six
Bore and stroke . . . . . . $3\frac{1}{8}''$ x $4\frac{5}{8}''$
Displacement . . . . . . . . . 212.8 cu. in.
Actual H. P. at 3000
R.P.M. . . . . . . . . . . . . . . . 67.5 H. P.
S.A.E. rated H. P. . . . 23.44
Torque at 1200
R. P. M. . . . . . . . . . . . . . 144.5 ft. lbs.
Compression . . . . . . . . . 98 lbs. per sq. in.
Compression ratio . . . . 5.2 to 1
Firing order . . . . . . . . . . 1-5-3-6-2-4

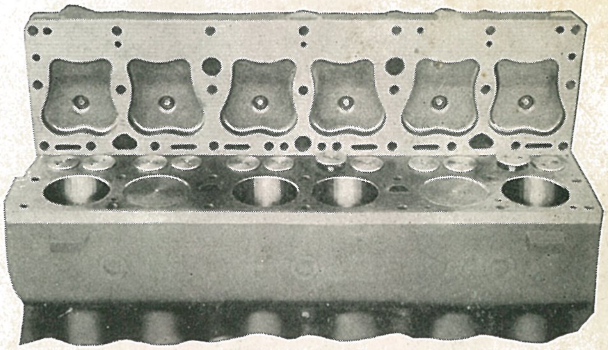


Fig. 9. Contour of Combustion Chamber

### Cylinder Block and Crankcase

The cylinder block and upper crankcase are a one-piece casting of alloy iron. Cylinder bores and valve seats are completely surrounded by water and the water jacket extends below the head of the piston when in its lowest position. Cylinder bores are bored, reamed and honed.

The crankcase is reinforced by radial ribs to each main bearing and by two horizontal ribs extending the full length on the outside of the case.

The bottom face of the case is $2\frac{1}{2}''$ below the center line of the crankshaft. This construction provides an exceptionally rigid foundation for the engine.

### Cylinder Head

The cylinder head is a single casting of alloy iron attached to the block by twenty-four $\frac{7}{16}''$ cap bolts. The combustion chamber which is recessed in the head, has been so shaped and the spark plug so located as to produce maximum power, with minimum detonation.

### Cylinder Head Replacement

When replacing cylinder head, always use a new gasket coated on both sides with light cup grease or cylinder oil. Tighten the cylinder head bolts in the order as shown in Fig. 10, drawing all bolts down and then repeating the operation in the same order until all are normally tight. After engine has been run sufficiently long to bring to normal operating temperature, bolts should be given a final tightening.

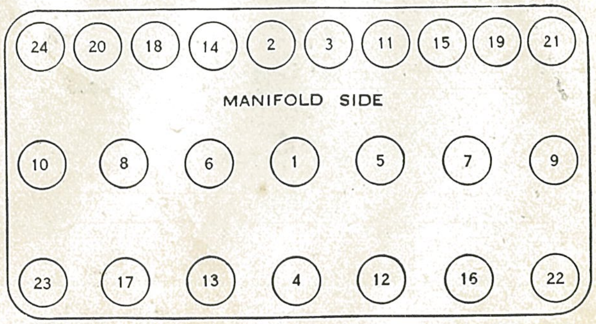



Fig 10. Tighten Bolts in Order Shown

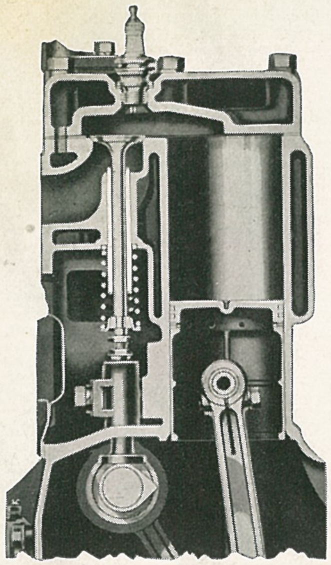


Fig. 11. Cross Section Combustion Chamber

## Lower Crankcase

Lower crankcase is made of pressed steel with transverse baffles, one ahead and one behind the oil pump to prevent surging of oil. Oil drain plug is located at the lowest point on the bottom.

## Crankshaft

The crankshaft is a four bearing, four counterweight type, made of drop forged, heat treated carbon steel. The bearing journals and throws are exceptionally heavy. Main bearing journals are "step" type, the rear journal being the largest in diameter. The four counterweights are each attached to the shaft by two studs, the nuts of which are spot welded. Because of the short length of this shaft and the "stepped" main bearings a torsion balancer is not used. The assembly of shaft and counterweight is balanced both statically and dynamically within 7/8 ounce inch.

Weight—Shaft with counterweights, 75 lbs.

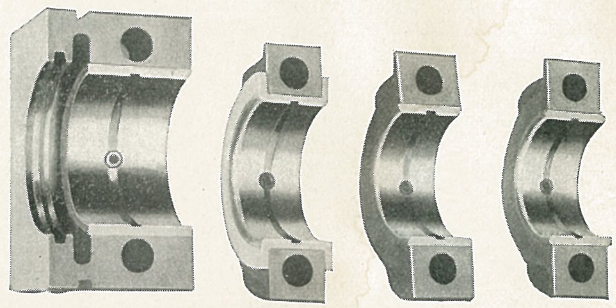


Fig. 13. Main Bearing Caps

## Main Bearings

Main bearings are steel backed babbitt lined dowelled in crankcase and bearing caps. Caps are inset in crankcase ensuring maintenance of alignment. Each cap is held by two studs 9/16″ diameter.

| BEARINGS | DIAM. | LENGTH |
|---|---|---|
| Front | 2 5/16″ | 1 15/32″ |
| Front center | 2 3/8″ | 1 1/2″ |
| Rear center | 2 1/2″ | 1 1/2″ |
| Rear | 2 9/16″ | 1 29/32″ |

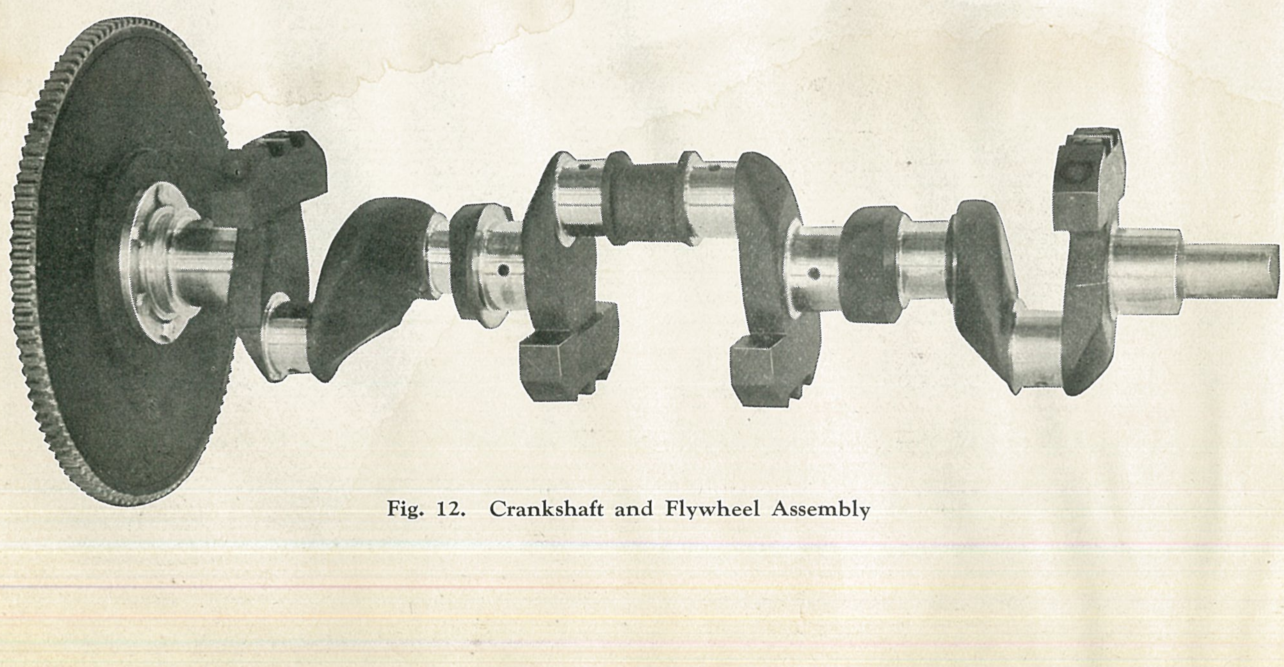


Fig. 12. Crankshaft and Flywheel Assembly

### Main Bearing Clearance

Shims are provided to allow adjustment for wear without necessity of filing the caps.

Radial clearance...........0015″ to .0035″

End clearance............

Rear center............. .004″ to .007″

Other three.......... 1/32″ at each end

### Flywheel

The flywheel is of proper weight to ensure good low speed idling and is balanced statically within 3/4 ounce inch and dynamically within 1/2 ounce inch. The starter ring gear is shrunk on the flywheel and spot welded to it.

Diameter.....................14 7/16″

Weight with ring gear.........31 lbs.

Teeth in ring gear.............114

Teeth in pinion................9

Pitch..........................8-10

Reduction.....................12.66 to 1

### Flywheel and Clutch Housing

The upper section of the housing is made of cast iron with integral engine arms and the lower pan of pressed steel. The upper section is bolted to the rear of the crankcase and two 1/2″ dowels maintain alignment. The rear face is counterbored to receive the transmission front bearing and maintain alignment of transmission main shaft and crankshaft.

### Pistons

Pistons are exceptionally light and made of cast iron. They are relieved at pin bosses and the bosses are bronze bushed to receive piston pin. Three ring grooves are provided, all above the piston pin. The lower groove is drilled with ten 5/32″ oil return holes.

Each piston is selected for its respective bore to pass of its own weight on a feeler of a thickness to correspond with the minimum clearance and hold its own weight on one corresponding to the maximum clearance. Feelers used are 1/2″ wide.

Height—overall.........3 13/16″

Height—pin from bottom 1 9/16″

Offset of pin toward camshaft.................3/32″

Piston clearance..........0015″ to .0025″

### Piston Rings

Three diagonally split rings, all above the pin, are used on each piston. The upper two are plain compression rings 1/8″ wide and the lower is a double slotted oil control type 3/16″ wide.

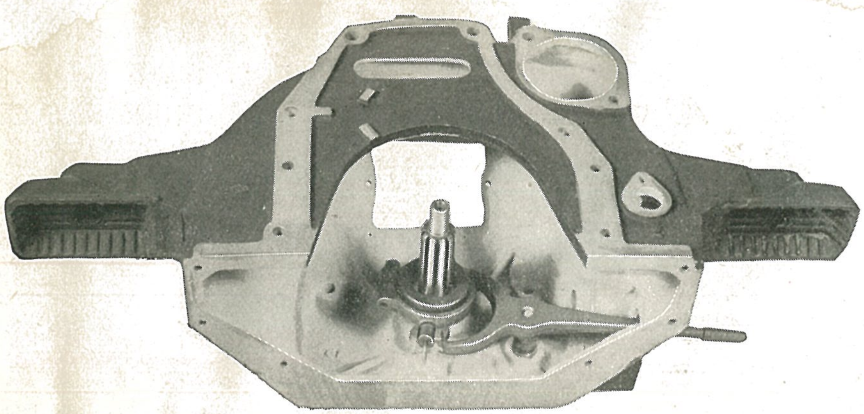


Fig. 14. Flywheel Housing

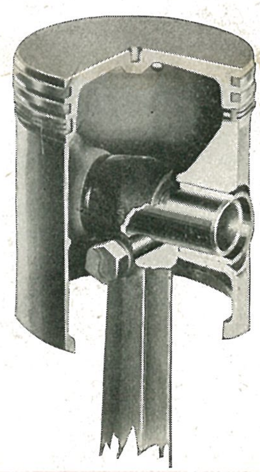


Fig. 15. Piston Cut-a-Way

## Piston Pins

Piston pins are hardened and ground and hollow to reduce weight. The hole is tapered from either end with greatest wall thickness at center for maximum strength where clamped in the connecting rod. Pin oscillates in bronze bushings in the piston. Pins are offset in piston 3/32″ toward camshaft side.

Diameter of pin.................13/16″

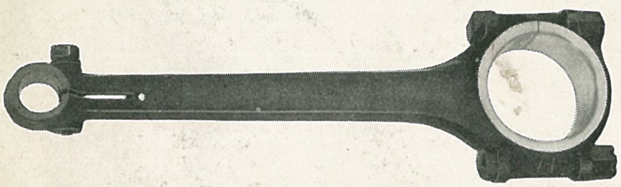


Fig. 16. Connecting Rod

## Connecting Rods

Connecting rods are heat treated drop forged steel with I-beam section. The lower end bearing is babbitt lined bonded directly to the steel of rod and cap. Shims are provided to allows adjustment without filing.

Length—center to center...9¾″

Lower Bearing

Diameter..............2⅛″

Width.................1⅜″

Bearing bolts.............Two—7/16″

Bearing clearance

Radial..................001″ to .004″

Side—total..............005″ to .009″

## Camshaft

The camshaft is made of heat treated drop forged steel and is supported in the upper crankcase in four bronze bushings. Cam and bearing surfaces are case hardened and ground. The oil pump and distributor shaft drive gear is integral with the camshaft. Camshaft is driven from the crankshaft by a silent type chain.

| BEARING SIZES | DIAM. | LENGTH |
|---|---|---|
| Front | 2 1/16″ | 1 3/16″ |
| Front center | 2 1/32″ | 1 3/16″ |
| Rear center | 2″ | 1 3/16″ |
| Rear | 1 25/32″ | 1 1/16″ |

## Valves

Valves are one-piece construction. Inlet valves are made of chrome nickle steel and exhaust valves of Silchrome No. 1 steel.

Valve stems are guided in the casting in removable cast iron guides.

## Valve Sizes

Clear—dia....Inlet 1½″ Exhaust 1⅜″

Stem—dia....Inlet ⅜″ Exhaust ⅜″

Lift...................324″

Lash—hot....006″ Cold....007″

## Timing

Inlet opens.......... 5° Before U.D.C.

Inlet closes..........45° After L.D.C.

Exhaust opens........45° Before L.D.C.

Exhaust closes........18° After U.D.C.

Fig. 17. Camshaft

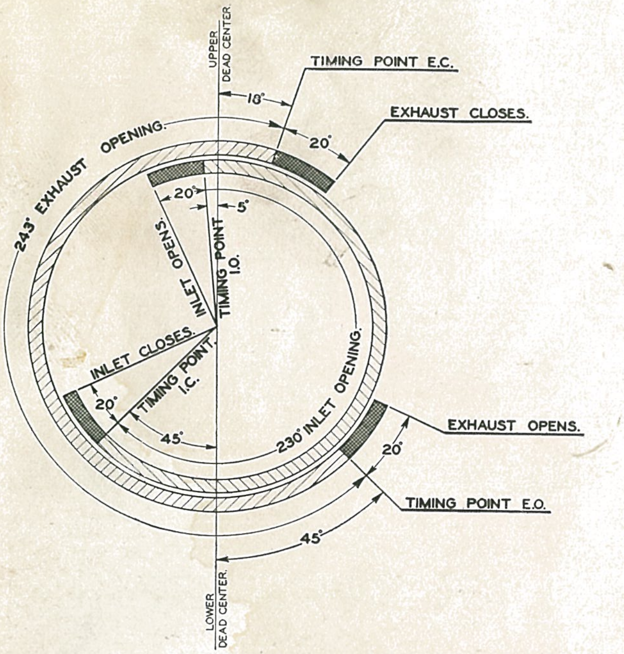



Fig. 18. Valve Timing Chart

## Valve Lifters

Valve lifters are mushroom type of two-piece construction. The body is tubular to reduce weight and is pressed onto a boss on the solid head. Both the body and head are hardened and ground.

Lifters are carried in three removable cast iron guides in compartments at the side of the cylinder block. These compartments are open to the crankcase to provide lubrication for the lifters, guides and valve stems.

Lifters are offset from the center of the cams to cause rotation and prevent wear of the heads and to provide uniform side pressure in the guide.

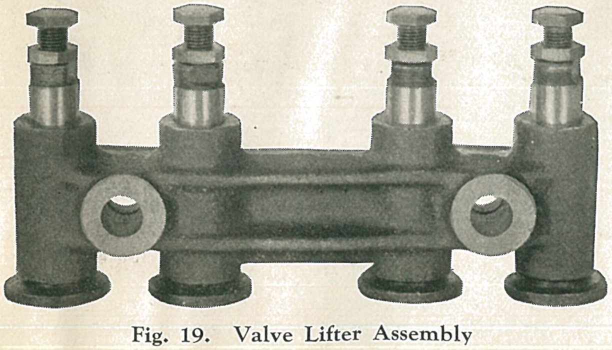


Fig. 19. Valve Lifter Assembly

## Lifter Sizes

Body diameter . . . . . . . . . . . . . . . . 5/8″
Head diameter . . . . . . . . . . . . . . . . 1 5/16″
Length—total . . . . . . . . . . . . . . . . 2 15/16″

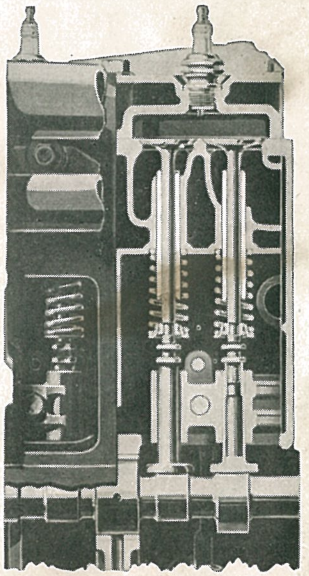


Fig. 20. Cross Section Through Valves

## Valve Springs

Springs are made of Manganese steel, tapered from 1″ diameter at the top to 1 1/8″ at the bottom.

Free length . . . . . . . . . . . . . . . . 2 7/8″
Valve closed—Length . . . . . . . . 2 1/4″
Pressure . . . . . . 40 to 46 lbs.
Valve open—Length . . . . . . . . 1 15/16″
Pressure . . . . . . . 65 to 71 lbs.

## Lifter Compartment Covers

Lifter compartments are provided with pressed steel covers and sealing gaskets. Each cover is held by two studs and wing nuts.

## Timing Chain and Sprockets

Camshaft is driven by silent chain. No adjustment of chain is provided. Width of chain, 1¼″.

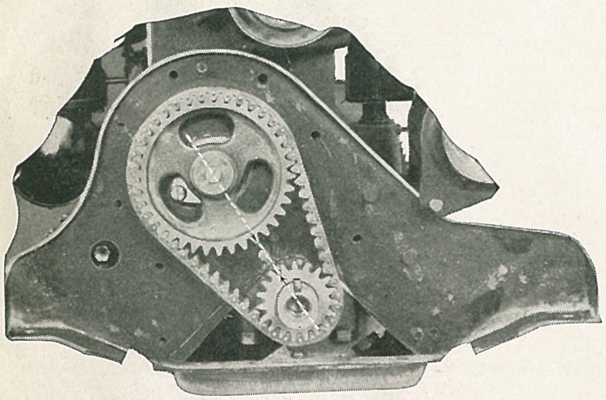


Fig. 21. Sprocket Timing Marks

The camshaft is correctly timed when the arrows on the camshaft and crankshaft sprockets are in the line of centers of the two shafts as shown in Fig. 21.

The crankshaft sprocket is a push fit, the camshaft sprocket is a press fit.

To remove the chain, the camshaft and its sprocket must be pulled forward as a unit at the same time that the crankshaft sprocket is slipped from the crankshaft.

To replace the chain, reverse the operation.

## Cooling System

Capacity of system............2½ gal.

## Radiator

Radiator core is a Harrison vertical flow, ¼″ Hex cellular type. Water passages and cooling fins are all copper. A pressed steel shell encloses the core and supports it on the frame cross member to which it is attached by two bolts.

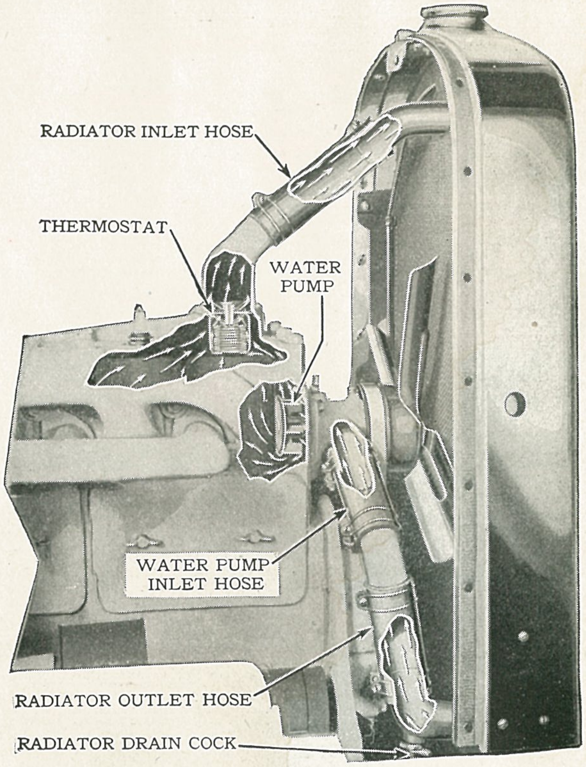



Fig. 22. Cooling System Cut-a-Way

## Core

Frontal area.................430 sq. in.

Thickness....................2¼″

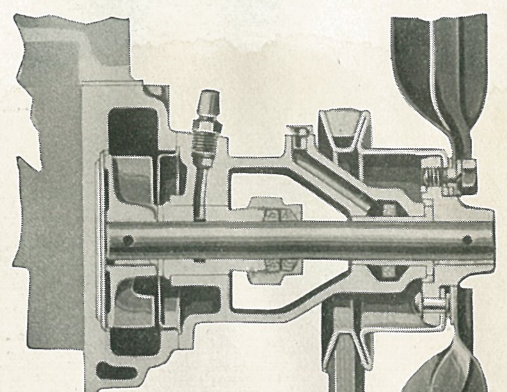


Fig. 23. Cut-a-Way Pump and Fan

## Fan

A four blade fan is mounted on the water pump shaft which is driven at 1$\frac{1}{16}$ times engine speed by a "V" type belt from a pulley on the crankshaft. Belt tension may be regulated by moving the generator which is held in position by a slotted strap and bolt.

Fan blade diameter, 16$\frac{7}{8}$″.

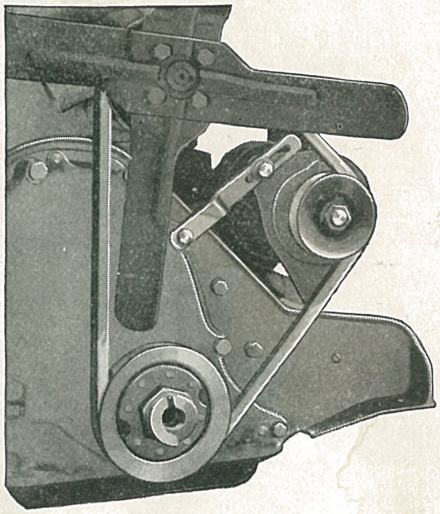


Fig. 24. Fan Belt Adjustment

## Water Pump

A centrifugal type water pump is mounted in the front end of cylinder block and driven by a "V" type belt from a pulley on the crankshaft. The hardened and ground pump shaft is supported by a bronze bushing in the pump body and by an outboard bearing directly in line with the fan belt track. The bronze bearing in the pump body should be lubricated with transmission lubricant No. A-200, through a Zerk connection provided.

The outboard bearing, made of porous bronze, is provided with an oil reservoir and a circular wick which surrounds the bearing and keeps it saturated with oil. The reservoir should be filled with engine oil.

Impellor diameter . . . . . . . . . . . . . . . . 2$\frac{7}{8}$″

Impellor width . . . . . . . . . . . . . . . . . . . $\frac{13}{16}$″

Shaft diameter . . . . . . . . . . . . . . . . . . . $\frac{39}{64}$″

## Thermostatic Water Control

Circulation of water is controlled by a thermostat placed in the cylinder head outlet to the radiator. This unit consists of a metallic bellows directly connected to a poppet valve. The valve remains in a closed position and prevents circulation when water temperature is below 130°. When the temperature reaches 130° the bellows expands, opening the valve and permitting water circulation through the cooling system.

This control ensures quick warm up of the engine after starting, maintains a temperature above 130° while engine is operating and prevents thermosyphon circulation after engine has been stopped.

The thermostat requires no adjustment and may be easily removed for inspection.

## Water Temperature Gauge

A water temperature gauge is mounted on the instrument panel. The element is attached to the cylinder head.

## Lubrication System

Engine lubricating system is a force feed type. Oil is supplied under pressure to the main, connecting rod and camshaft bearings, and to the timing chain and sprockets.

The gear type pump, driven by a vertical shaft through helical gears from the camshaft, is located at the lowest part of the lower crankcase. The pump delivers oil

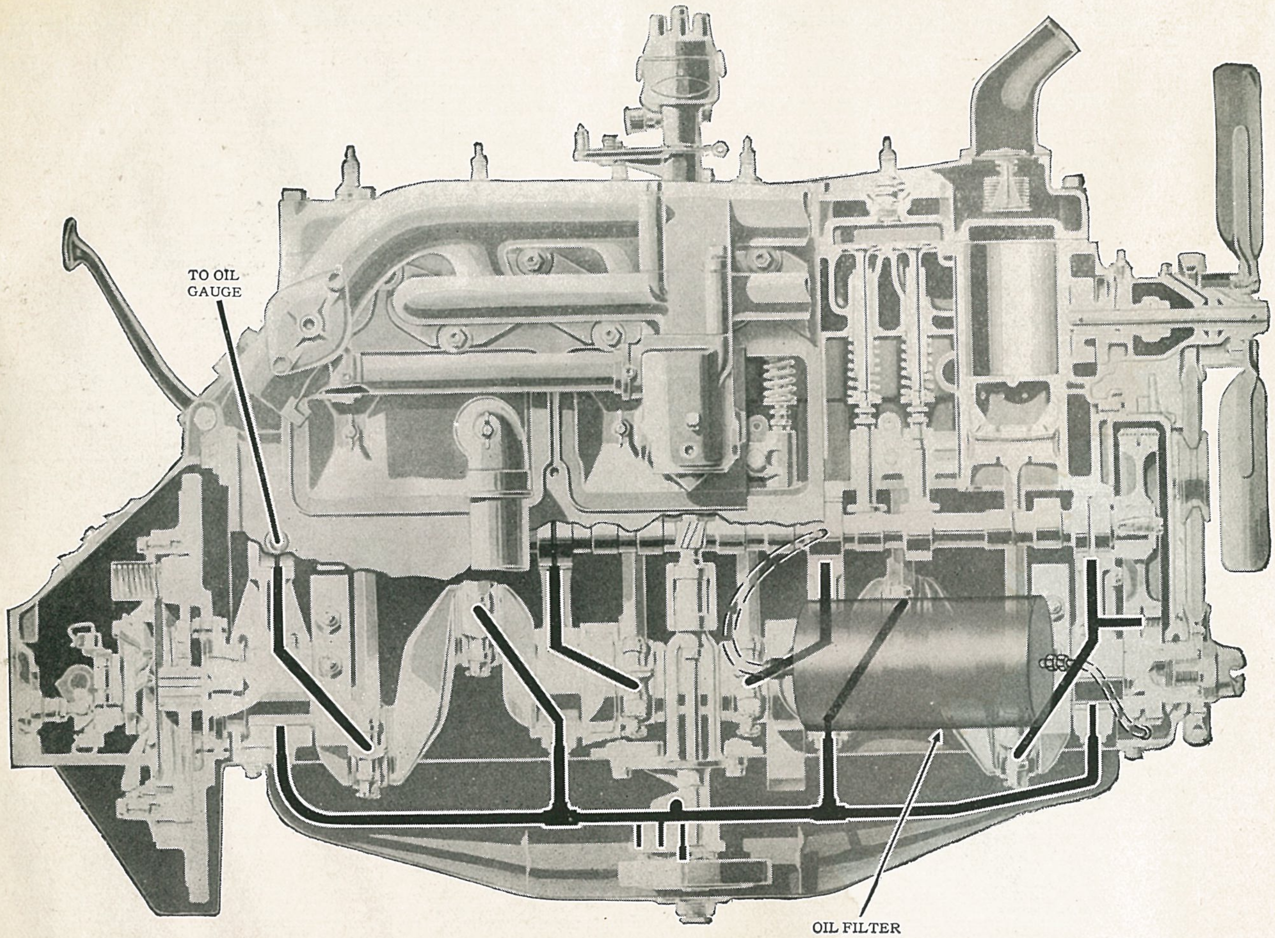



Fig. 25. Engine Lubrication System

under pressure, through a header pipe, to the four main bearings. When the pressure becomes sufficient, in the header pipe, a ball check valve, located within the pump body, opens against spring pressure allowing part of the oil to discharge directly into the intake side of the pump.

Each main bearing has a ring groove cut around its center. Communicating with each groove is a hole drilled through each web of the crankcase forming a passage for oil to each of the four camshaft bearings.

The crankshaft is drilled from the main journals to the crank pin journals as follows:

| Main Bearing | | Crank Pins |
|---|---|---|
| No. 1 | feeds | No. 1 |
| No. 2 | feeds | Nos. 2 and 3 |
| No. 3 | feeds | Nos. 4 and 5 |
| No. 4 | feeds | No. 6 |

A pipe connection to the oil passage between the front main and front camshaft bearings sprays two streams of oil on the timing chain and sprockets. Surplus oil from the timing chain case flows back to the lower crankcase.

Two holes are drilled through No. 2 camshaft journal, 90° apart, forming a cross. Two holes are also drilled through the camshaft bearing 90° apart. One of these is the

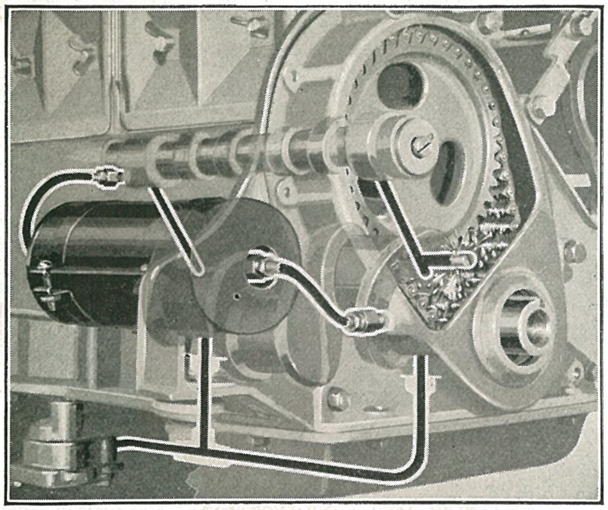


Fig. 26. Chain and Sprocket Lubrication

lead from the main bearing and the other, through the crankcase wall, is connected to the inlet side of the oil filter.

As the camshaft rotates, first one end and then the other pair of holes through camshaft journal, register with the holes in the bearing, forming momentarily a passage through which oil is forced from the main bearing to the oil filter.

The filter is protected from excessive pressure due to the fact that the rate of rotation of the camshaft definitely limits the volume of oil delivered to the filter. After passing through the filter the oil is delivered through a pipe to the timing chain case.

A line from No. 4 camshaft bearing leads to the oil pressure gauge on the instrument panel.

Cylinder walls, pistons, piston pins and bearings are lubricated by oil sprayed through a small hole drilled, 40° from the center line of rod, on the upper side of each connecting rod bearing. Oil is sprayed through this hole once each revolution of the crankshaft.

The combination oil filler and crankcase breather is located on the left side of the crankcase. An oil measuring stick is also provided.

Oil Capacity

Dry engine .......................6 qts.

Refill...........................5 qts.

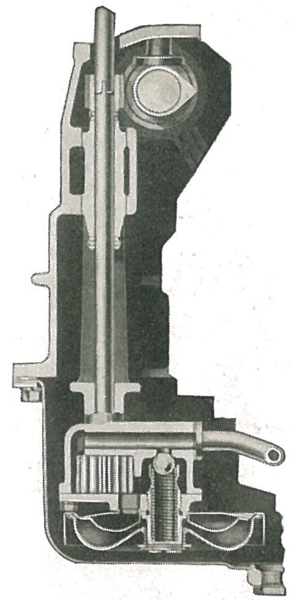


Fig. 27. Cut-a-Way Oil Pump

## Oil Pump

The oil pump is located at the lowest part of the lower crankcase between two transverse baffles which prevent surging of the oil. Pump consists of two steel gears 1″ wide enclosed in a cast iron housing. Oil is drawn to the pump through a fine mesh screen at the bottom. The pump is driven from the camshaft through helical gears and the driving gear of the pump is attached to the shaft by a Woodruff key. The by-pass valve is a ball and spring type set for 40 lbs. maximum pressure at the gauge.

## Oil Filter

A sealed container type oil filter is connected in the pressure oiling system on the "by-pass" plan. By this method a portion of the oil from the pump flows through the filter continuously. A pipe from No. 2

camshaft bearing delivers oil under pressure to one end of the filter. After it has passed through the filtering element it is discharged through a second pipe to the timing chain case. The filtering element is a rolled up cloth bag having 400 sq. in. of filtering surface.

The filter should be replaced every 10,000 miles to ensure best results. However, should the filter become fully clogged, it will not interfere with the distribution of oil to other parts of the system.

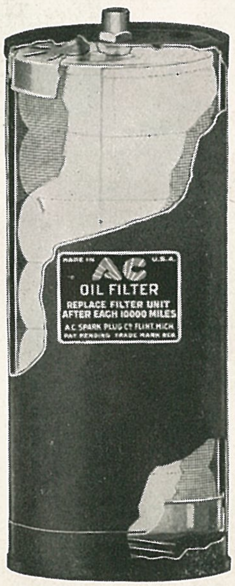



Fig. 28. Cut-a-Way Oil Filter

## Crankcase Ventilator

The combination oil filter and crankcase breather has an opening toward the front through which air is blown into the crankcase by the fan. A filtering pad is provided in this breather to clean the ingoing air. An outlet tube is fitted to the rear valve lifter compartment cover and extended below the side pan. The air stream passing through the crankcase carries off vapors of both fuel and water, thereby keeping dilution of engine oil to a minimum. This type of ventilator has no moving parts and requires no attention.

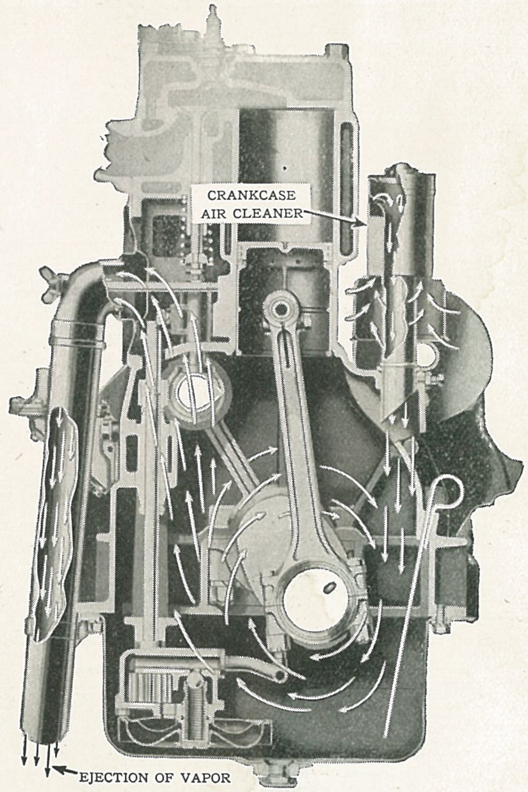



Fig. 29. Crankcase Ventilator

## Inlet Manifold

The inlet manifold is a four port type with main runner and leads of circular section. A hot spot is provided at the central portion as an aid to complete vaporization in addition to the heat riser between manifold and carburetor. Steel ferrules are provided at each port and the manifold is clamped to the cylinder block by studs and nuts, two to each port.

Inside diameter .................... $1\frac{3}{16}''$

## Carburetor

The carburetor is a Marvel, model VM, automatic air valve, multiple nozzle type.

This instrument consists of a main body or mixing chamber to which is attached a

float chamber bowl, a double walled heat riser, in which the throttle is carried, heated by gases from the exhaust manifold under automatic control of a damper valve therein, and an exhaust outlet pipe.

Within the mixing chamber are three non-adjustable nozzles which proportion the gasoline for a proper mixture. One of the nozzles called the "low speed," is located in the center of the venturi which is a fixed air opening. The other two nozzles called "high speed" and "intermediate high speed" are located just under the air valve and controlled by it. An air adjustment screw is provided for regulating the pressure of the air valve spring enclosed therein and is the only mixture adjustment required. Within this screw is also enclosed a plunger connected by a link to the air valve. The function of this plunger is to provide a resistance in addition to that of air valve spring to richen the mixture for acceleration. This arrangement of plunger, spring and hollow screw is termed the dash pot.

A further control of the "high speed" and "intermediate high speed" jets is provided by the "economizer" which is a fuel metering valve operated by the carburetor throttle. This valve provides the maximum fuel feed to these nozzles when the throttle is fully opened for high speeds, hard pulling, and for quick "pick-up." During the part throttle driving range this valve controls the amount of fuel being used, thus providing all the economy possible. This valve is entirely automatic and requires no adjustment.

### Choker and By-Pass

A choke button is provided on the instrument board to assist in starting. Pulling out this button performs two operations in the carburetor. First, it closes a butterfly choker valve in the air inlet of carburetor, which restricts the air opening and consequently produces a very rich mixture in mixing chamber. Second, it opens a by-pass valve in a passage from the mixing chamber to the riser passage above the throttle. Due to the high suction existing above throttle, the over-rich mixture in mixing chamber is immediately drawn through the fixed opening in by-pass valve, up past the throttle and on into the engine. Partial release of choker button on instrument board after starting, releases choker valve so that it positions itself to the needs of the engine, due to the action of a compensating spring attached to the choker valve shaft. Choker now becomes automatic in its action, the spring allowing the valve to open or close in proportion to the engine speed and volume of air passing through carburetor. This partial release of choker button does not, however, change position of by-pass valve, which remains open, and engine therefore runs at an increased idling speed during this period, same as would be obtained if the throttle were manually opened slightly and there was no by-pass valve. This gives the car a speed of approximately 14 to 15 miles per hour on the road automatically, without the necessity of opening the throttle, and is of great assistance in getting under way after starting a cold engine.

As soon as engine is sufficiently warmed choker button should be completely released and choker valve automatically locks in wide open position.

### Heat Control

The carburetor and manifolds have been

designed to utilize the exhaust gases of the engine to insure complete vaporization and a consequent minimum consumption of fuel. This is accomplished by a double walled riser placed between the carburetor and intake manifold. This riser is connected with the exhaust manifold in such a manner that the exhaust gases pass through a hot spot section of the intake manifold, enter an opening at the top and back of riser, pass through riser jacket, and return through a tube to exhaust pipe. The amount of heat thus furnished is controlled by the damper valve "A" in the exhaust manifold just above the outlet tube from the riser. See Fig. 30.

This damper valve is connected to the throttle stop lever of carburetor by a connecting rod in such a manner that the greatest amount of heat is had in jacket of riser when the throttle is only partly opened, as in idling and at low speeds, and a decreasing amount as the throttle is opened further for higher speeds. By means of a season adjusting stud on the heat control lever on damper valve shaft, this automatic action of the heat valve may be varied to suit weather and driving conditions.

The damper valve described above is assembled in the exhaust manifold casting. On the inside of this damper valve cover is a boss acting as a locating stop for the damper valve. This stop determines the closed position of the damper valve and is to be used in assembling connecting rod to throttle stop lever. The normal position of damper valve is slightly clear of this boss when the season adjusting stud on heat control lever is set at "hot" position with throttle closed.

An adjustment for seasonal control of heat is provided on the damper valve lever whereby the amount of exhaust heat deflected to the riser jacket may be decreased by setting damper adjusting stud "J" in either hook-up hole marked "medium" or "cold" thus initially opening damper valve

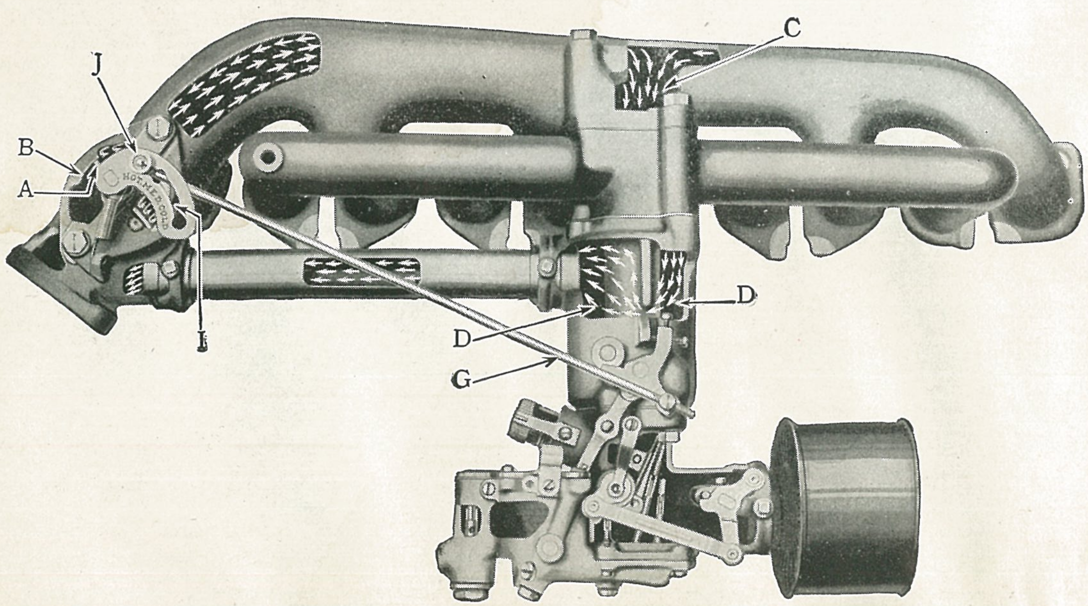



Fig. 30. Heat Control—"Hot" Setting

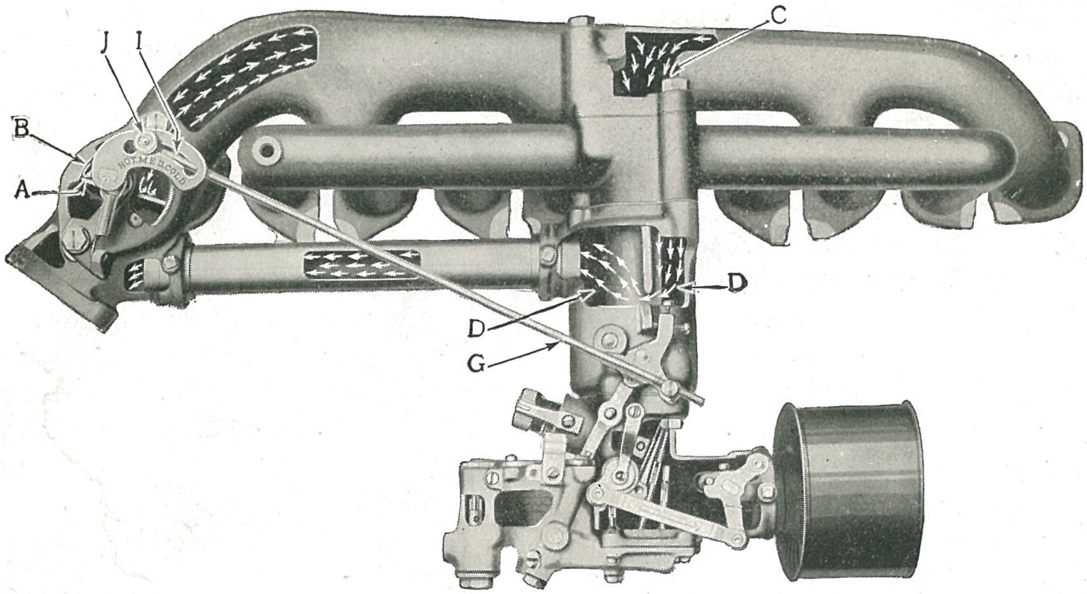



Fig. 31. Heat Control—"Medium" Setting

at closed throttle position and greatly reducing the heat application.

Valve "A" see Fig. 30, is connected by rod "G" to sthrottle stop lever. As throttle is opened, valve "A" is also opened and the volume of exhaust gas through heat jacket of riser will be lessened as the engine speed increases.

Fig. 30 shows heat control in "hot" setting. At closed throttle valve "A" is at extreme right edge of the land "B" in exhaust manifold. As throttle is opened, the valve "A" rotates counter clock-wise and its edge passes across land "B". The valve, however, does not open until it clears the land "B," ensuring maximum heat in riser jacket up to the amount of throttle opening which will provide a speed of approximately 35 to 40 miles per hour. At higher speeds, further opening of the throttle automatically moves valve "A" rapidly away from land "B" which allows freer flow of exhaust gas and consequently reduces heat to riser. This "hot" setting of the heat control should be used throughout the cold season.

Fig. 31 shows heat control in "medium" setting. At closed throttle, valve "A" is near the extreme left edge of land "B" in exhaust manifold and ready to open with very little throttle opening. This setting, therefore, ensures less deflection of exhaust heat to riser jacket than in the "hot" position, and valve "A" as before moves rapidly to its open position as throttle is fully opened.

This "medium" setting of heat control should be used throughout the normal seasons, when the weather is neither the extreme of hot nor cold.

Fig. 32 shows heat control in "cold" setting. At closed throttle, valve "A" is beyond the edge of land "B" in exhaust manifold. As throttle is opened, valve "A" rapidly moves to full open position, to give the least deflection of heat through riser jacket.

This "cold" position should be used in climates where extreme hot weather is experienced, or where very high test or light fuels are used.

The adjustment of heat control is purely seasonal and largely controls the car per-

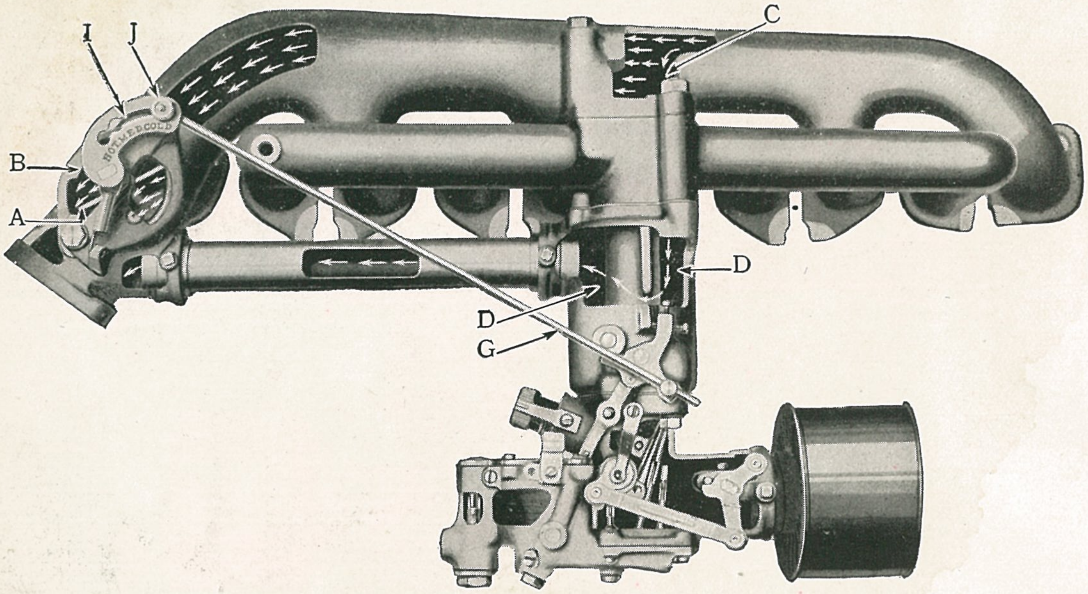



Fig. 32. Heat Control—"Cold" Setting

formance, or the effect of the "rich" or "lean" action in the carburetor. Therefore, in cold weather, adjustment should be set at "hot" to provide quick warm-up after starting, and sufficient heat for good performance. In extremely warm weather, setting should be at "cold," and for all intermediate seasons, at "medium" for most average driving.

### Starting

To start engine, pull out choke button all the way. Advance spark by pushing spark button all the way in and depress starter pedal.

The moment the engine fires the choke button should be pushed in very slightly and engine allowed to run at normal speed for a few minutes. If engine hesitates, pull out choke button slightly and push back in to a point where engine runs smoothly during this short period, the object being to secure momentarily a richer mixture to assist engine in warming up. The automatic heat control of the carburetor makes it entirely unnecessary to use an excessive amount of fuel by overchoking while engine is warming up, and thereby prevents dilution of engine oil.

### Adjustment

No changes should be made in the carburetor adjustment until after an inspection has been made to determine if the trouble is in some other unit. It should be noted that the gasoline lines and strainer are clear; that the fuel pump is properly supplying fuel; that there are no leaks at connections between carburetor and engine; that the ignition system is in proper condition; and, that there is even compression in all cylinders.

If it is necessary to test adjustments or to make a readjustment, proceed as follows:

Set air screw so that end is flush with the end of rachet spring bearing against it.

Set heat control in "hot" setting and leave in this setting while making adjustment. Pull out choker to close position and start engine in usual manner. As soon as engine has fired, release choker very

slightly. Run for a few moments until engine has warmed up, remembering never to use choker more than necessary, as when not needed it has a tendency to foul up engine and dilute the lubrication oil in the crankcase.

Next, set air screw for good idle by either turning it to the right a little or backing out to the left as the needs of the engine require. With the engine warmed up, the adjustment of the air screw for proper idling is easily accomplished. If the air screw is turned in too tight, the motor will roll or appear sluggish. If the air screw is not tight enough, the motor will hesitate and stumble, and perhaps stop entirely. To adjust for best idling, turn air screw back to the left until engine hesitates, which indicates that mixture has too much air and is too lean; next, turn air screw in to the right three or four notches at a time until engine runs smoothly. This idle setting accomplished, the proper adjustment for the entire range of the engine will have been attained.

If the engine idles too fast with throttle closed, the latter may be adjusted by means of throttle lever adjusting screw.

### Specifications

| | |
|---|---|
| Air intake diam. | 1 3/4" |
| Air valve diam. | 1 3/4" |
| Throttle diam. | 1 7/16" |
| Air valve spring | No. 24-315 |
| High speed jet | No. 49-95-C-32 |
| Intermediate high speed jet | No. 49-100-E-24 |
| Low speed nozzle | No. 49-130-A-10 |
| Meter pin jet | No. 84-086 |
| Meter pin | No. 173-528 |
| Venturi diam. | 3/8" |

### Air Cleaner

The air cleaner prevents dust particles from entering the combustion chambers through the air intake of the carburetor. The suction created in the intake manifold by the pistons draws air through the cleaner. At the inlet to the cleaner are directing vanes which give the air stream a spiral rotation. Centrifugal force throws the dust particles against the outside wall of the cleaner from which they are swept through an opening at the bottom. The clean air stream reverses its direction and passes through the center of the cleaner to the carburetor.

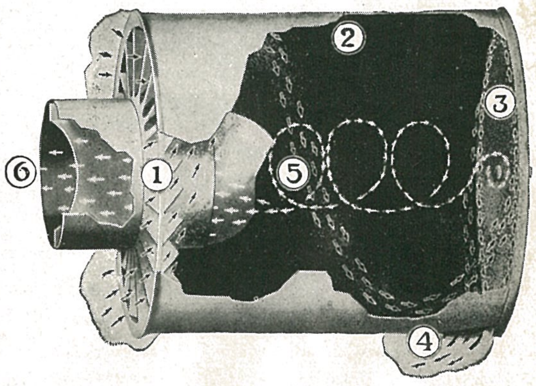



Fig. 33. Cut-a-Way Air Cleaner

### Fuel Pump

The AC Type B variable stroke diaphragm fuel pump is attached to the right rear side of the crankcase and driven by an eccentric on the camshaft. The fuel filter is an integral part of the pump.

### Operation of Pump

See Fig. 34.

The rotation of eccentric H on camshaft actuates rocker arm D, pivoted at E, which pulls linkage F, and in turn diaphragm A, downward. The downward movement of the diaphragm creates a vacuum in chamber M which draws fuel through suction valve L in the outlet of fuel filter. On the return

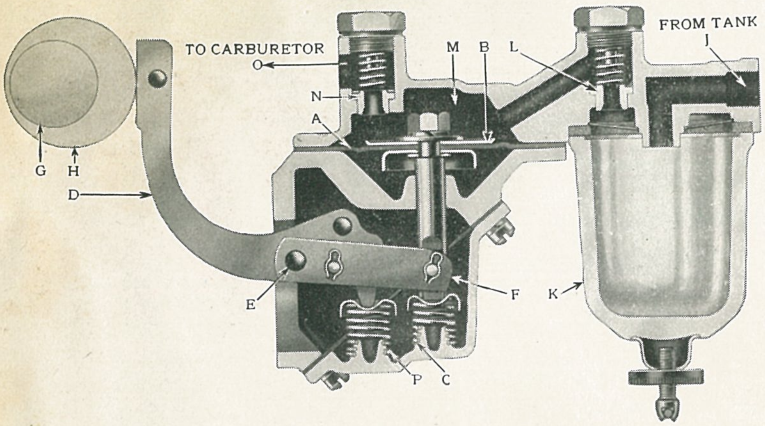



Fig. 34. Cut-a-Way Fuel Pump

stroke of the rocker arm, spring C moves diaphragm upward forcing the fuel from chamber M through pressure valve N and opening O to the carburetor.

When carburetor bowl is filled the carburetor float closes the inlet needle valve which creates a pressure in chamber M. As the pressure above the diaphragm increases, its stroke lessens to the point where the pressure in chamber M overcomes that of spring C and the movement of the diaphragm ceases until the lowering of the fuel in the carburetor opens the inlet valve needle

Spring P, is not a part of the operating mechanism but is merely for the purpose of keeping rocker arm D in contact with eccentric H to eliminate noise.

## Inspection and Corrections

Service on the AC fuel pump is available through United Motors Service Branches and Authorized AC Service Stations, who are prepared with parts and fixtures for repairing all types of pumps. There are some service operations on this fuel pump that can, if necessary, be done without referring to the service station and these are tabulated in the following paragraphs.

In some instances trouble is attributed to the fuel pump which in reality is caused by some other condition. These should be carefully checked to avoid the needless replacement of fuel pumps.

## Lack of Fuel at the Carburetor

Gasoline tank empty—Refill.

Leaky tube or connections — Replace tubing and tighten all pipe connections at the fuel pump and gasoline tank.

Bent or kinked tubing—Replace tubing.

Glass bowl loose—Tighten thumb nut, making certain that cork gasket lies flat in its seat and is not broken.

Dirty screen—Remove glass bowl and clean the screen. Make certain that cork gasket is properly seated when reassembling.

Loose valve plug—Tighten valve plug securely, replace valve plug gasket if necessary.

Dirty or warped valves—Remove valve plugs and valves. Wash valves in gasoline. If damaged or warped, replace them. Ex-

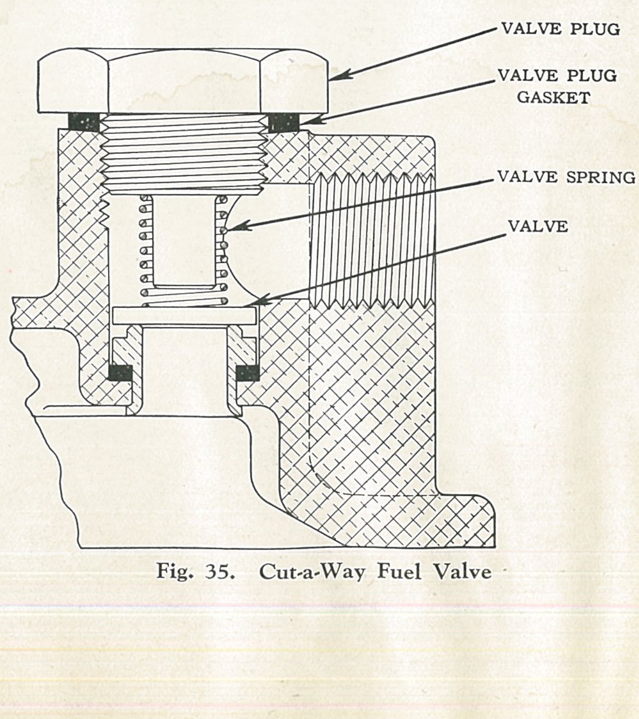



Fig. 35. Cut-a-Way Fuel Valve

amine valve seat to make certain there are no irregularities which prevent proper seating of valves. Place valve in valve chamber with the polished side downward. Make certain that valve lies flat on its seat and is not left standing on edge. Reassemble valve plug and spring, making certain that spring is around the lower stem of the valve plug properly. Use new gasket under valve plug if necessary.

### Leakage of Fuel at the Diaphragm

Loose cover screws– Tighten cover screws alternately and securely.

CAUTION: Do not disassemble the pump body.

NOTE: Sometimes there appears to be a leak at the diaphragm, whereas the leak actually exists at one of the pipe fittings and the fuel has run down the pump to the diaphragm flange, appearing to originate there.

### Flooding of the Carburetor

Carburetor needle valve not seating— Check carburetor for proper adjustment.

IMPORTANT: Do not attempt to disassemble the fuel pump further than described above, because it is absolutely necessary to use a small fixture in reassembling the pump when once taken apart. When the above remedies do not correct the condition, replace with a new fuel pump sending the old fuel pump to your nearest AC service station.

### Fuel Filter

The fuel filter is an integral part of the fuel pump. It comprises a glass bowl with a double screen of fine mesh, through which the fuel must pass downward. Dirt and water settle in the bowl which may be easily removed for cleaning.

### Fuel Tank

The gasoline tank located at the rear of frame is neatly covered by sheet metal. Filler tube located at the right end of the tank is fitted with a bayonet type cover.

Tank capacity.................13 gallons

### K-S Telegage

The K-S telegage consists of three units— tank unit, head and air line. In operating condition the air tube and air chamber of the tank unit and the air line connecting the tank unit to the head are filled with air. See Figs. 38 and 39. The fuel tends to rise to the same level in the tank unit as it is in the tank and thereby exerts a pressure on the air trapped between the bottom of the tank unit and the liquid in the head. This pressure is directly proportional to the amount of fuel in the tank, therefore, the height of the red liquid in the "U" tube of the head indicated the depth of fuel in the tank. The scale is calibrated to give a reading in gallons.

The tank unit, Fig. 36 shows the air

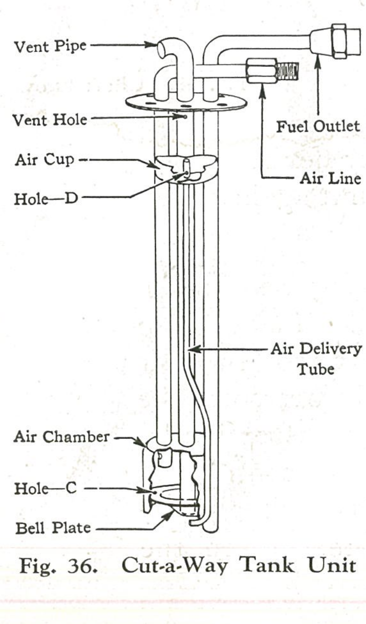



Fig. 36. Cut-a-Way Tank Unit

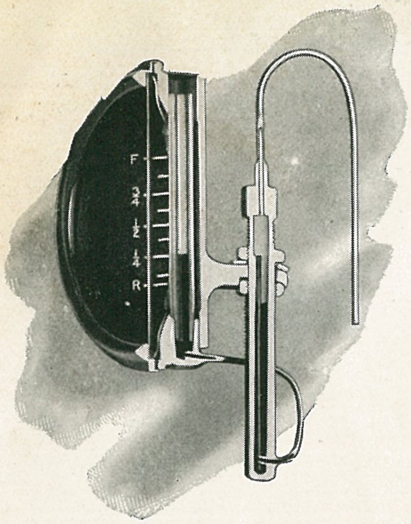



**Fig. 37. Cut-a-Way Fual Geuge**

chamber and air tube which must always be filled with air. The pressure of the fuel is communicated through the hole C. The vent tube which is open at the top is not an operating part of the unit but is provided as a safety device to protect the unit against high pressure.

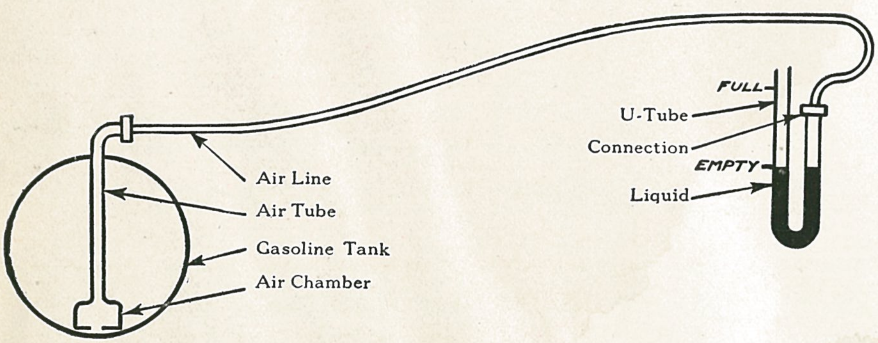



**Fig. 38. Chart Showing Tank Empty**

An air cup and air delivery tube function to supply air to the air chamber to overcome the loss due to absorption by the fuel and contraction due to a lowering of the temperature. When the air cup is above the level of the fuel in the tank it is constantly filled by the surge and splash of the fuel when the car is in motion. This fuel runs through the drain hole D and through the air delivery tube drawing with it bubbles of air. These bubbles leave the bottom end of the air delivery tube under the air chamber and pass through hole C displacing any fuel that might be in the chamber. When the air chamber is filled with air the bubbles pass upward through the fuel in the tank and are not used.

The head, Fig. 37, mounted in the instrument panel is a U-tube containing a special heavy red liquid. The front leg of the U is a glass tube open at the top. The rear leg is a brass tube connected at the top to the air line and at the bottom to the lower end of the glass tube.

The air line, connects the air tube of the tank unit to the top of the vertical brass tube of the head. The pressure of the air in the air line forces the liquid downward in the brass tube and upward in the glass tube. The difference in level of the liquid in the two tubes is an exact measure of the pressure of the air in the air line. Since this pressure is directly proportional to the

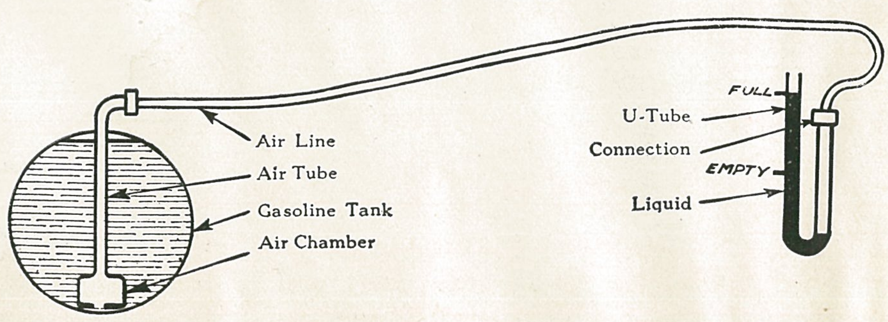



**Fig. 39. Chart Showing Tank Filled**

depth of the fuel the height of the red liquid exactly records on the graduated scale the number of gallons of fuel in the tank.

To have the gauge read correctly three conditions must be maintained:

1. The red liquid in the head must be set at the bottom line on the scale when the air line is disconnected and this setting should be permanent. If the head will not hold this setting it should be returned for replacement to any one of the General Motors parts depots.

2. The air system must be free from leaks or obstructions. The most common obstruction is fuel which can only be driven into the line when there is an air leak or the connections are not properly made. Fuel being a moving obstruction will cause an erratic reading of the gauge.

3. The tank unit must supply air by the surge and splash of the fuel as described above.

When these three conditions are correct and a quantity of fuel is placed in the tank the red liquid will rise in the glass tube when the car is driven until it records the true contents of the tank. Stopping, starting, and turning corners will hasten the rise of the red liquid. After the correct level has been obtained the reading will always be correct unless the air line leaks or is disconnected.

### Reserve

The Telegage provides a reserve of approximately one gallon. The bottom gallon in the tank is not recorded on the scale as the hole C is above the gasoline suction pipe opening.

Above the mark R on the scale the gauge registers accurately gallon for gallon the amount of fuel placed in the tank.

### Adjustments and Checks

Correction of a faulty Telegage is very simple if the following adjustments and checks are made exactly as outlined and in the proper order. Do not remove the head from the instrument board until the instructions have been followed:

### Adjustments

1. Remove tank filler cap. Do not replace until adjustments have been completed.

2. Disconnect air line from the head and make the red liquid read even with the bottom line on the scale. If necessary liquid may be added or removed at the top of the brass tube at the connection for the air line. To fill use a medicine dropper. To remove liquid use a match or toothpick. to absorb some of the liquid.

Use only K-S Telegage liquid which has been selected because of its specific gravity and other characteristics. No other liquid will function properly. This liquid may be purchased from the manufacturer of the gauge.

3. Dry the air line.

Use a hand tire pump only. Never use air supplied by an air compressor. Remove the metal connection from the hose, push the end of hose over the instrument panel end of the air line and give the pump at least 40 full strokes.

4. Verify that the gauge has held its reading. If the reading has dropped the head leaks and must be replaced. If reading has held to the line reconnect the air line to the head and check to see that the connection at the tank unit is tight. Replace the tank filler cap.

Check No. 1 should now be made to determine that the trouble has been corrected by the above adjustments.

## Checks

1. Determine if the gauge can be brought to the proper reading by supplying air to the tank unit. The only method of supplying air is by driving the car. Stopping, starting and turning corners will bring the reading up quickly as the supply of air depends upon the surge of the fuel in the tank. If the reading will stay set with car standing the gauge is correct. If no reading can be secured by driving the car or if the reading does not hold when the car is standing locate the failure by Check No. 2.

2. Determine whether the failure is in the air line or the tank unit.

Disconnect the air line at both ends.

Inspect the connections for dirt or flaws.

Hold a finger over one end of the line and suck on the other. If the suction created will hold the tongue for one minute the air line is not at fault.

If the air line shows a leak it should be replaced.

If air line and connections are correct the defect is in the tank unit which should be replaced.

CAUTION: Whenever repairs are made on a Telegage the air line should be blown out to clear it of any fuel which may have been driven into the line when it was disconnected from the head.

## Liquid

K-S Telegage liquid may be secured from the General Motors Parts Depots at Winnipeg, Regina, Calgary, Saskatoon, Edmonton, Vancouver, Saint John and Oshawa, in the following quantities:

| | |
|---|---|
| ⅛ oz. sufficient for filling | 3 gauges. |
| 1 oz. sufficient for filling | 20 gauges. |

## Exhaust Manifold

The exhaust manifold is a six port type attached to the cylinder block by twelve studs and nuts, two to each port. It is flanged to the hot spot of the intake manifold and carries the carburetor heat control valve just above the valve connection for the exhaust pipe.

Inside diameter body . . . . . . . . . . 1⅜″ to 2″
Inside diameter ports . . . . . . . . . . 1⅜″

## Exhaust Pipe

Exhaust pipe connecting exhaust manifold and muffler is a steel tube. It is attached to the manifold by a two-bolt flange and inserted into and clamped to the front leader of the muffler.

Diameter . . . . . . . . . . . . . . . . . . . . . . . . . . . 2″

## Muffler

Muffler is made entirely of sheet steel and consists of an outer shell which encloses four compartments separated by baffles. Extending through the center of three compartments is a perforated tube also divided into two compartments and supported by two baffles. Exhaust gases pass successively through the inner and outer shell compartments to the tail pipe. This con-

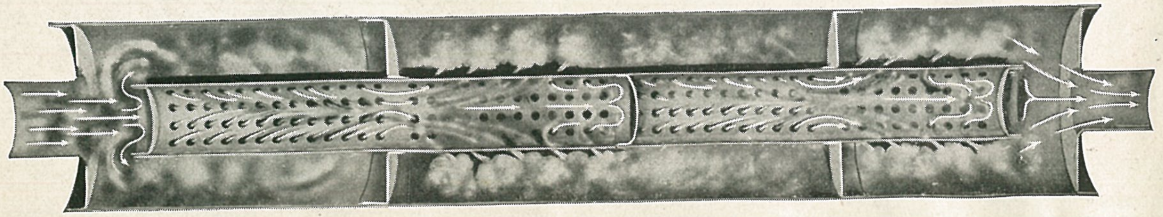


Fig. 40. Muffler in Section

struction provides a quiet exhaust with a minimum of back pressure.

Diameter . . . . . . . . . . . . . . . . . . . . . . . . . . $5\frac{16}{64}''$

Length . . . . . . . . . . . . . . . . . . . . . . . . . . . . 28″

### Tail Pipe

The tail pipe is made of steel tubing extending from muffler to rear of car. Its length is such that the gases are discharged behind the car and exhaust noise is lessened.

Diameter . . . . . . . . . . . . . . . . . . . . . . . . . . $1\frac{1}{2}''$

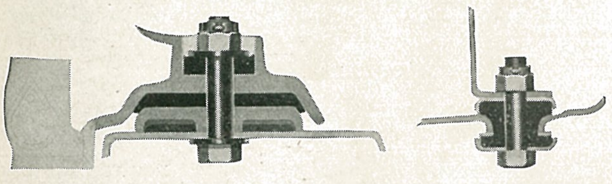


Fig. 41. Rear Front
Engine Mountings

### Engine Suspension

The engine is supended at four points and insulated from the frame by rubber mounting.

The forward arms are a part of the pressed steel plate bolted between front of crankcase and timing chain cover. The rear arms are cast integral with the flywheel housing.

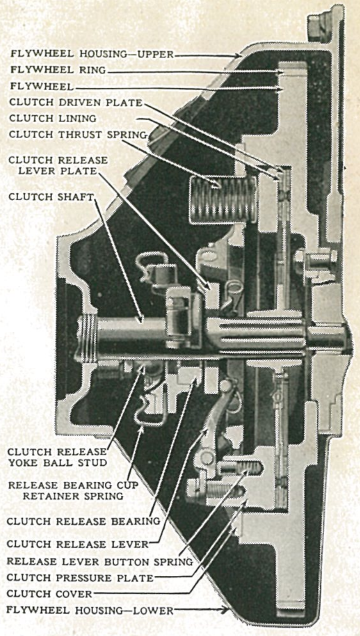



Fig. 43. Clutch—Sectional

### Clutch

The clutch is a single dry disc type, 9″ diameter completely enclosed in the flywheel housing. The single driven disc, which is flexibly mounted on the hub by means of eight coil springs absorbs shocks of engagement and dampens vibrations in the power line. This spring steel disc carries two moulded facings on arched segments

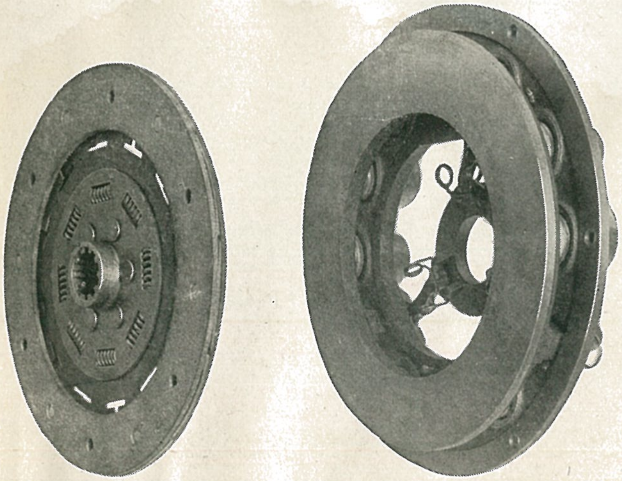


Fig. 4 . Clutch Disc—Driving Member, Front

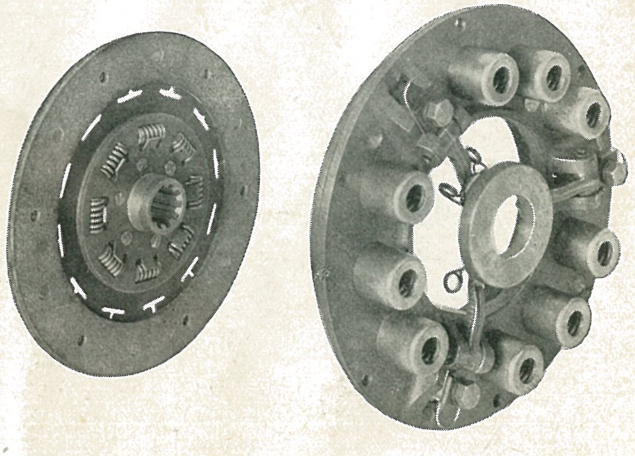


Fig. 44. Clutch Disc—Driving Member, Rear

which provide easy gradual engagement with the driving plate and the fly wheel.

The clutch is held in engagement by nine coil springs in the driving member. These springs require no adjustment.

The clutch release bearing, mounted on a trunnion yoke, is self-aligning and made of baked carbon graphite which is self-lubricating and noiseless.

Area friction surface 64.8 sq. in.

Facing dimensions,
8⅞″ OD x 6⅛″ ID x ⅛″ thick.

The clutch requires no adjustment, however, an adjustment is provided at the lower end of the clutch pedal consisting of a cap screw and lock nut to provide clearance at the clutch release bearing.

To make this adjustment loosen lock nut at the clutch pedal adjusting lever. Turn adjusting screw to the left or counter-clockwise until pedal pad has a free travel of 1″ to 1¼″. Tighten lock nut.

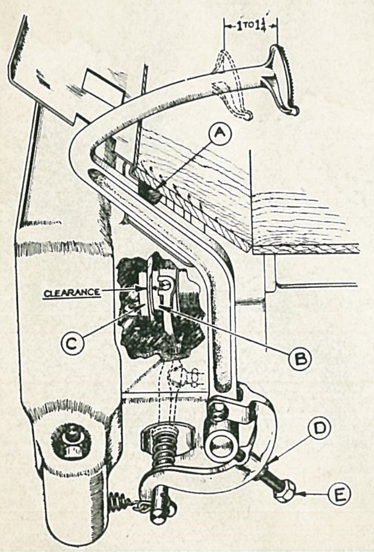



Fig. 45. Clutch Pedal Adjustment

## Transmission

The transmission is a three speed selective type bolted to the flywheel housing. The clutch shaft rear bearing recesses in a counterbore in the flywheel housing to

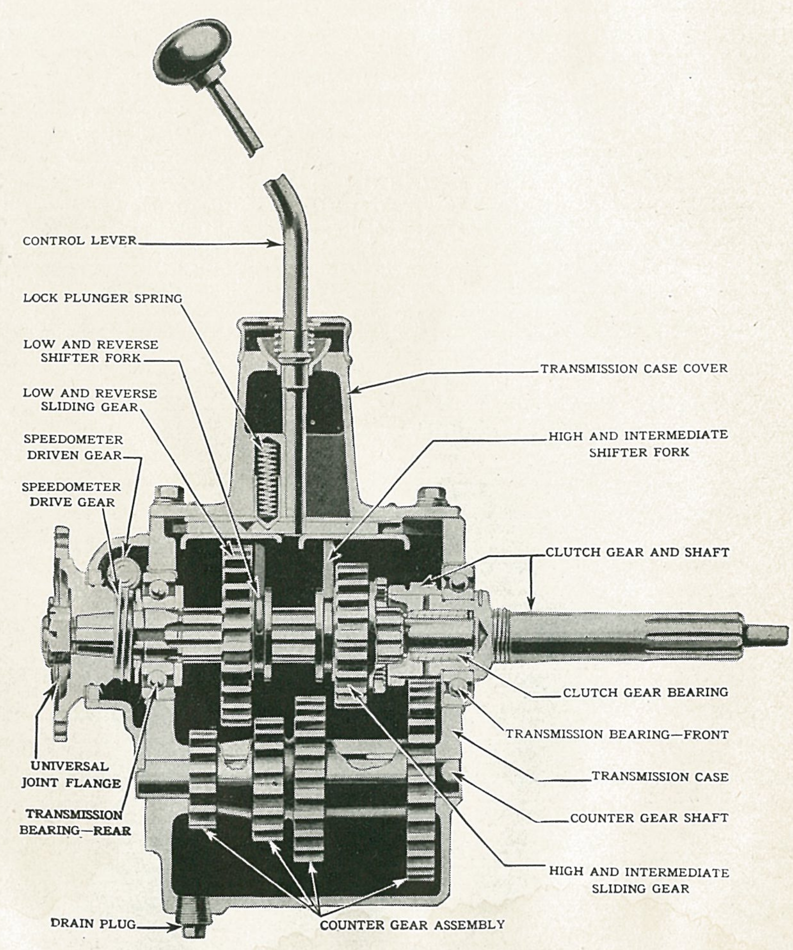



Fig. 46. Transmission—Cross Section

ensure correct alignment of transmission main shaft with the crankshaft.

All gears are made of heat treated chrome alloy steel and the teeth are burnished for quiet operation. The main shaft is ten splined and carried in a single row ball bearing in the rear of the case and a roller bearing in the rear end of the clutch shaft.

The clutch shaft is carried in a single row ball bearing in the transmission case and in an oilless bronze bushing in the rear end of the crankshaft.

The counter gear assembly is machined from a single drop forging and carried on two bronze bearings on the stationary shaft.

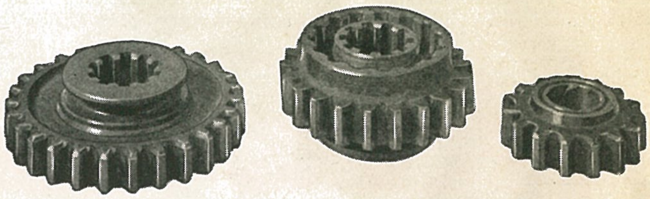


Fig. 50. Sliding Gears

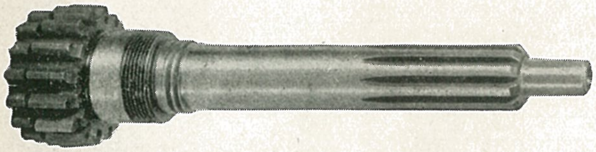


Fig. 47. Clutch Shaft

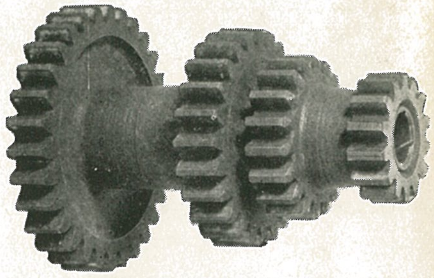


Fig. 51. Counter Gear Assembly

Fig. 48. Main Shaft—Pilot Bearing

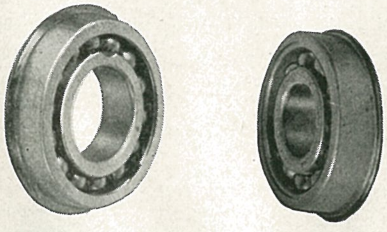


Fig. 49. Transmission Bearings

### Transmission Bearings

| | |
|---|---|
| Clutch gear shaft—Rear | No. 1208 N. D. single row. |
| Clutch gear shaft—Front | Durex ⅝″ x 11/16″ |
| Main shaft—Pilot | Hyatt No. RA-135, ¾″ ID x 1⅛″ OD x 1½″ long |
| Roller diam. | M″ |
| Main shaft—Rear | No. 1306 N. D. single row |
| Counter gear—Bushings | Two ⅞″ diam. x 1¾″ plain bronze |
| Idler gear bushing | One ⅞″ diam. x 13/16″ plain bronze |

### Transmission Gears

| | NO. TEETH | PITCH |
|---|---|---|
| Clutch gear | 15 | 7 |
| High and intermediate sliding | 21 | 7 |
| Low and reverse sliding | 27 | 7–9 |
| Countershaft—Constant mesh | 30 | 7 |
| Countershaft—Intermediate | 24 | 7 |
| Countershaft—Low speed | 18 | 7–9 |
| Countershaft—Reverse | 14 | 7–9 |
| Reverse idler | 15 | 7–9 |

### Gear Reductions

| | AT WHEEL |
|---|---|
| High—Direct | 4.545 |
| Intermediate—1.75 to 1 | 7.953 |
| Low—3.00 to 1 | 13.635 |
| Reverse—3.857 to 1 | 17.53 |

Lubricant required to fill to proper level—2 pints.

### Universal Joints

Two metallic universal joints are used.

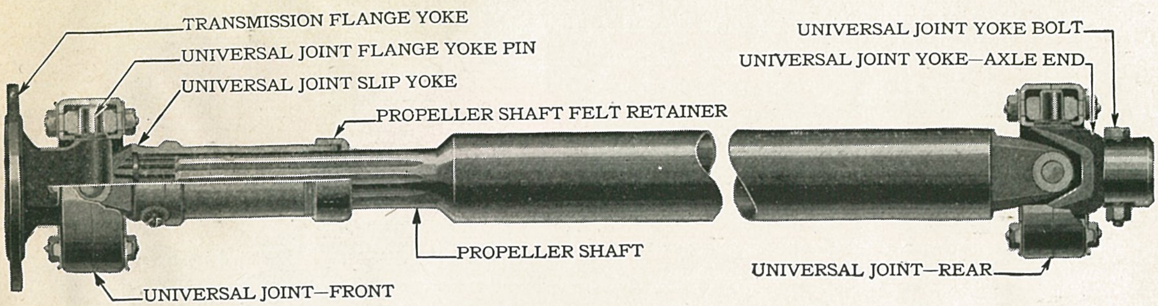



**Fig. 5. Universal Joints and Propeller Shaft**

The rear joint is attached to the pinion shaft by four splines and retained by a bolt through the center. The front yoke of this joint is welded to the tubular propeller shaft.

The front joint is attached to the main shaft of transmission by means of a flange and four bolts. The rear yoke of this joint is attached to the propeller shaft by means of a ten-splined "slip joint." This joint is required because of the forward and backward movement of the rear axle as its position relative to the frame changes due to load or road conditions.

Outside diameter....................3 7/8″

Yoke pin diameter...................19/32″

## Construction

The principal parts of this joint are the housing made in two parts; the yokes with driving trunnions, and the four bushings. The housing, which also serves as the connecting driving member, is made of two steel stampings the edges of which are surface ground. The narrow surfaces and the extremely great pressure that the eight nuts exert when drawn into place, makes for a very high unit of pressure between the surfaces in contact, and causes the two surfaces to fit each other perfectly and make an absolutely tight joint.

End thrust is taken on the flat ends of trunnions against flat surfaces on inner periphery of universal joint housing.

## Disassembly

If the propeller shaft is to be removed take out the bolt which locks rear universal joint to the pinion shaft. Push shaft forward enough to remove the hub from the splined end of pinion shaft, and pull splined end of propeller shaft from the slip joint of the front universal. To remove front universal joint assembly remove the six bolts in the companion flange.

If it is desired to disassemble the joint proper, it can be done very easily by removing the eight nuts holding the two oil retaining housings together. After all of the nuts have been removed a slight tapping on the ends of the protruding studs will cause the housings to separate. Care should be taken not to damage the ground surfaces where the two housings join. In reassembling care should be taken to see that all four cork packing washers are in place, and that they have not been damaged in handling. All of the eight nuts should be drawn up a little on each stud so that they are all brought home together. It is advisable to paint the ground surfaces of the housings with a thin shellac.

The spline must be entered in slip yoke so as to bring the trunnions of the yoke on rear end of shaft parallel with the trunnions of the slip yoke on front end of shaft. This is done by bringing the two arrows in line as shown in Fig. 53. If this is not done a rough and unsatisfactory performing joint will result.

### Lubrication

Because of these features of construction every bearing point operates within the oil chamber where it can be thoroughly flooded with oil and the moment the joint begins to revolve, a pressure due to centrifugal force is set up in the oil which really tends to make the bearings pressure oil lubricated.

The lubrication of the spline or slip joint is also provided for The spline fitting operates in a self-contained chamber which has no connection whatsoever with the joint proper. A special plug is provided for lubrication of the splines.

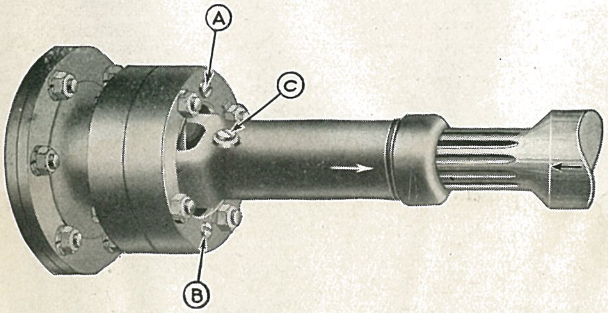



**Fig. 53. Front Universal Joint**

There are two oil plugs provided in each joint. When filling joints with oil turn same so that the two plugs are in a perpendicular position. Remove both plugs. Screw a Zerk connection in lower hole allowing upper hole to serve as an air vent. Using the pressure gun, force lubricant into the joint. When oil runs out of the upper hole the joint is filled and the plug should be inserted. Remove the Zerk connection and replace with the second plug. CAUTION: Do not replace oil plugs in joint housing with the fittings as furnished with special pressure oil or grease guns. Such fittings are not designed to hold oil and centrifugal force may cause leakage. A heavy oil suitable for use in rear axle or transmission is satisfactory.

### Propeller Shaft

The propeller shaft consists of a steel tube 2″ outside diameter, with a spline shaft welded to the forward end. This end provides the slip joint in connection with the front universal joint. The front yoke of the rear universal joint is welded to the rear end of the shaft.

### Rear Axle

The rear axle is a semi-floating type employing a one-piece pressed steel housing and a malleable differential carrier. The differential is a two-pinion type enclosed in a single malleable casting supported on two single row ball bearings. The drive pinion shaft which is forged of high carbon steel integral with the pinion is supported in the differential carrier on one single row and one double row ball bearing. Both differential and pinion assemblies are removable from the carrier without removing axle from the car.

Ring gear and pinion are spiral bevel cut.

Axle shafts are forged of Manganese steel and heat treated. Inner ends are ten-splined to carry the differential side gears and are locked to the gears by means of a split washer. End thrust is taken by the differential bearings, a steel spacer block,

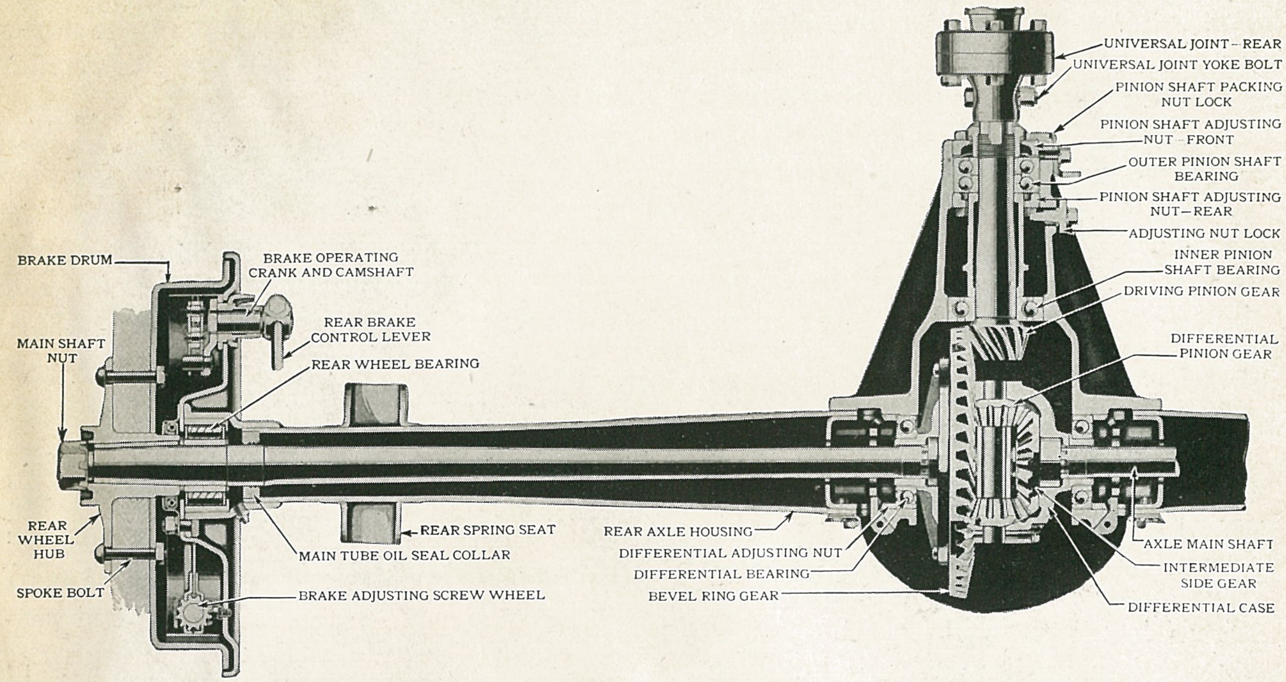



**Fig. 54. Rear Axle—Sectional**

being placed between the inner ends of shafts and retained by the differential pinion shaft.

Spring seats are welded to the housing.

A baffle is attached to housing cover to direct a continuous stream of oil to the differential gears.

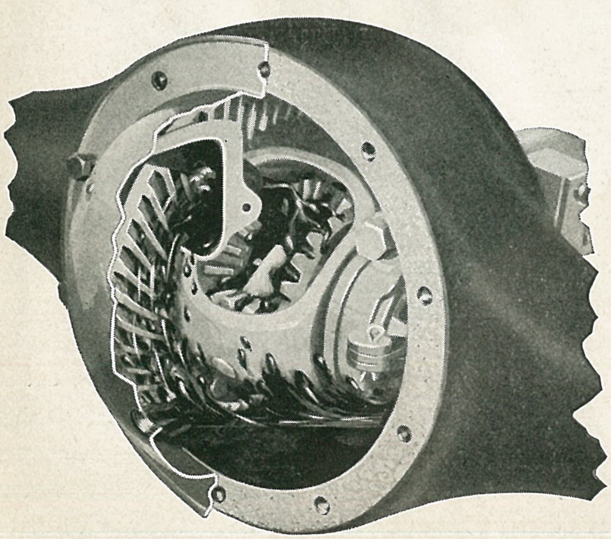


**Fig. 55. Differential Lubrication**

## Axle Details

Housing tube—Smallest diameter .............. 2½″
Housing—Wall thickness . 3⁄16″
Differential bearings ..... No. 0208 N. D. Single Row
Pinion shaft bearings
  Outer ............... No. 5306 N. D. Double Row
  Inner ............... No. 1307 N. D. Single Row
Pinion shaft dia ......... 1 5⁄32″
Differential pin dia ....... ¾″
Tread—Rear wheels ...... 57″
Teeth in ring gear ....... 50
Teeth in pinion ......... 11
Ratio .................. 4.545 to 1
Axle shaft diameter:
  At wheel bearing ...... 1¾″
  Center portion ........ 1 1⁄16″
  At intermediate gear ... 1⅛″
Lubricant required in housing ............. 2½ pints
Clearance under center of housing ........... 8″